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GENERAL MEDICAL SERVICE STUDY
REPORT NO. 12-HF-0C7G-06

THE ASSOCIATION OF HEALTH RISK BEHAVIORS
AND TRAINING-RELATED INJURY
AMONG U.S. ARMY BASIC TRAINEES

APRIL 2006

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| <p>14. ABSTRACT While physiologic risk factors for injury in military training populations have been well-established, knowledge of behavioral risk factors is limited. This study investigated the association of health risk behaviors with injuries sustained by men and women in Army basic training. Self-reported questionnaire data on health risk behaviors collected on entry to training were linked to medical data on injuries occurring during the 9-week training period. Multivariate survival analysis tested the association of training-related injury with a risk-taking index consisting of five individual health risk behaviors (cigarette use, smokeless tobacco use, alcohol use, weight control practices, and diet/lifestyle choices). Analyses were conducted separately for men and women, and models controlled for demographic, physical fitness, and physiologic characteristics. Among this sample of 1,156 young men and 746 women (median age: 19), cumulative injury incidence was 4.2 trainees/1,000 trainee-days for men and 9.3 trainees/1,000 trainee-days for women. Males in both the lowest (Hazard ration (HR)=1.73, 95%CI:1.47,2.05) and highest (HR=1.92, 95%CI:1.57,2.34) risk-taking index categories had greater risk of training-related injury compared to persons within one standard deviation of the mean risk index score. Cigarette use was independently associated with training-related injury; males in the medium risk cigarette use index category had 1.8 times the risk of a training-related injury compared to the low risk category (HR=1.77, 95%CI:1.31,2.40). An association between the combined risk-taking index and injury was not seen among females. However, females in the high risk cigarette use category (HR=1.53, 95%CI:1.10,2.12) and females in the medium (HR=1.08, 95%CI:1.03,1.14) and high risk (HR: 1.52, 95%CI:1.21,1.93) diet/lifestyle categories had higher risk of training-related injury compared to females in low risk categories. Occupational training-related injury risk was more closely associated with individual health risk behaviors (e.g., tobacco use, diet/lifestyle choices) among women, while injury risk was influenced by tobacco use and risk taking-tendency among men, a behavioral risk factor in need of further study.</p> | | | | | |
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EXECUTIVE SUMMARY
GENERAL MEDICAL SERVICE STUDY
REPORT NO. 12-HF-0C7G-06
THE ASSOCIATION OF HEALTH RISK BEHAVIORS AND TRAINING-RELATED
INJURY AMONG U.S. ARMY BASIC TRAINEES
APRIL 2006

1. INTRODUCTION AND PURPOSE. Knowledge of behavioral risk factors for occupational injury, especially among working-age young adults, is limited. Additionally, physiologic risk factors for injury in military training populations have been well-established, while knowledge of behavioral risk factors for training-related injury in military populations is limited. This study examined the relationship between health risk behaviors and injury among a population of 1,902 young men and women who entered U.S. Army basic combat training (BCT) between March and June 2003.

2. METHODS.

Self-reported questionnaire data on prior health risk behaviors collected upon entry to training were obtained from the Pilot Survey of the Army Recruit Assessment Program (RAP). Results of correlation and principal components (factor) analyses were used to test relationships between and assess the potential for grouping variables into indices representing key health risk behaviors (alcohol use, cigarette use, smokeless tobacco use, diet/lifestyle choices, and weight control practices). A combined risk-taking index that combined risks associated with reported health behavior choices was created by assigning higher scores to questionnaire responses representing high risk behavior (such as, initiation of alcohol use prior to age 21 or smoking a pack or more a day) and lower scores to responses representing low risk behavior (such as, no regular use of alcohol or tobacco).

Data on injuries occurring during the 9-week training period were obtained from the Defense Medical Surveillance System for trainees who had completed the RAP survey between March and June 2003. Multivariate survival analysis was used to assess the association of training-related injury with the individual health risk behavior indices and the combined risk-taking index. Analyses were conducted separately for men and women, and models controlled for demographic, physical fitness (Army Physical Fitness Test results), and physiologic characteristics.

3. RESULTS.

Among this sample of 1,156 young men and 746 women (median age: 19), the majority were white (62.3%), single (82.8%), had a high school education (61.6%), and had enlisted as Regular Army (53.1%) as opposed to Reserve or National Guard.

RAP survey responses indicated that 71% of trainees under age 21 and 86% of those age 21 or older had consumed one or more alcoholic drinks in the past year. A greater proportion of males (41%) than females (38%) had their first alcoholic drink prior to age sixteen ($p=0.004$). Among trainees age 21 or older, a greater proportion of males (56%) than females (47%) had been drinking alcohol regularly for 2 or more years ($p=0.02$). More than 20% of trainees scored 5 points or more on the Alcohol Use Disorders Identification Test-Compressed (AUDIT-C) scale, a measure of alcohol misuse or abuse, and more than 20% of trainees scored a 1 or higher on the CAGE alcohol abuse and dependence screening tool, indicating a potential alcohol problem. Compared to females, a higher proportion of males had an AUDIT-C score above five ($p<0.001$) or a CAGE score above zero ($p=0.02$). Nineteen percent of all trainees in the sample had ever driven a car within 2 hours of having two or more alcoholic drinks. Based on factor analysis results (eigenvalue=3.7), these questions were grouped into an alcohol use index. The index explained 21% of the variance in a five-factor model.

RAP survey response to questions related to cigarette use indicated that 42% of the study sample had smoked a total of 100 or more cigarettes in their lifetime, approximately 40% smoked regularly at some point during their lifetime, and 32% had smoked on a regular basis for 2 or more years. Over 25% reported smoking every day in the year prior to entering the Army. The amount smoked differed by gender ($p=0.016$), with a greater proportion of males reporting they smoked a pack or more when they smoked regularly. A slightly higher proportion of males (20%) than females (19%) began smoking prior to age 16 ($p<0.001$). Factor analysis supported use of questions concerning years smoked, aged at first use, and number of packs smoked per day in an index describing cigarette use (eigenvalue=1.8). The cigarette use index explained 10% of the variance in a five-factor model.

Use of smokeless tobacco, a pipe, or cigar was higher among males compared to females ($p<0.001$). Among male trainees, 7%, 24%, and 18% reported smoking a pipe, cigar, or using smokeless tobacco, respectively, 3 or more times in the past year. Among female trainees, 7%, 24%, and 18% reported smoking a pipe, cigar, or using smokeless tobacco, respectively, 3 or more times in the past year. Factor analysis results grouped these three variables into one index (eigenvalue=1.6) that explained 9% of the variance in a five-factor model.

With regard to diet and lifestyle, nearly two-thirds (64%) reported watching television for 2 or more hours a day. A greater proportion of males (30%) than females (25%) drank an average of 4 or more caffeinated beverages a day ($p=0.01$). A greater proportion of males (67%) than females (62%) also ate fast food 2 or more times per week ($p=0.03$). Approximately 20% of the trainees never ate breakfast. More males (5%) than females (3%) reported never wearing a seat belt when driving or riding in a car ($p=0.01$). Factor analysis results grouped these 5 variables into one index (eigenvalue=1.5) that explained 8% of the variance in a five-factor model.

Finally, 42% of trainees reported weight changes in the past year. A greater proportion of females compared to males reported using diet pills, laxatives, and vomiting to lose weight ($p<0.001$). A greater proportion of males (2%) than females (1%), however, reported using steroids to lose weight or gain strength ($p=0.02$). Factor analysis results supported grouping these variables into one index (eigenvalue=1.3). The index explained 7% of the variance in a five-factor model.

Analysis of injury data indicated that 26% of males and 55% of females were injured during BCT. Cumulative injury incidence was 4.2 trainees/1,000 trainee-days for males and 9.3 trainees/1,000 trainee-days for females over the 9-weeks training period.

Multivariable analyses, controlling for demographic and physical fitness risk factors, indicated that males in both the lowest (hazard ratio (HR)=1.73, 95%CI: 1.47, 2.05) and highest (HR=1.92, 95%CI: 1.57, 2.34) combined risk-taking index categories had greater risk of any training-related injury compared to persons within one standard deviation of the mean combined risk index score. Cigarette use was also independently associated with training-related injury; males in the medium risk cigarette use index category had 1.8 times the risk of a training-related injury compared to males the low risk (nonsmoker) category (HR=1.77, 95%CI: 1.31, 2.40). An association between the combined risk-taking index and injury was not seen among females. However, females in the high risk cigarette use category (HR: 1.53, 95%CI: 1.10, 2.12) and females in the medium (HR: 1.08, 95%CI: 1.03, 1.14) and high risk (HR: 1.52, 95%CI: 1.21, 1.93) diet/lifestyle categories had higher risk of any training-related injury compared to females in low risk categories.

Analyses of additional injury outcomes indicated that the combined risk-taking index was also associated with overuse, traumatic, and time-loss training-related injuries among males, but no associations were observed among females. The cigarette use index was associated with all injury types among males and females. Among females, the diet/lifestyle index was associated with overuse and time-loss injuries.

4. DISCUSSION.

Analysis of RAP survey responses allowed for an unusually detailed understanding of the study sample with regard to personal background, reasons for entering the Army, life experiences, and emotional and mental health indicators. Information on health risk behaviors indicated that male trainees tended to smoke a greater quantity of cigarettes when smoking regularly and a greater proportion of males than females reported smokeless tobacco and cigar use, as also reported in surveys of U.S. young adults. Lifetime and current cigarette use did not differ significantly by gender, a result contrary to what has been reported for general U.S. population samples with similar age distributions.

The higher proportion of males reporting high-risk alcohol-related behaviors is consistent with what has been reported among U.S. youth. In a 2004 national survey of 18-25 year olds, 21% of males reported heavy alcohol use in the past thirty days, compared to 9% of females.

Additionally, as seen in 2001 Youth Risk Behavior Survey (YRBS) data (Grunbaum, Kann et al. 2002), males were more likely to report initiation of alcohol use at a younger age. This survey also indicated that 17.2% of males compared to 9.5% of females reported ever drinking and driving.

For two out of three diet-related health risk behaviors, consumption of fast food and caffeinated beverages, males reported somewhat greater frequency of these behaviors. The National Heart, Lung, and Blood Institute has recommended no more than two fast food meals a week; 67% of males and 62% of females in this sample exceeded this recommendation. In addition, 30% of males in this sample reported drinking 4 or more caffeinated beverages a day, compared to 25% of females. In addition to its association with long-term health effects, excessive caffeine use can lead to insomnia, sleep disruption, and subsequent daytime sleepiness, problems that are especially persistent in young adult populations and are associated with negative outcomes (such as, poor school performance, motor vehicle accidents due to falling asleep at the wheel) resulting from poor cognitive functioning.

With regard to the association of risk-taking with training-related injury, the higher injury risk seen among those with higher risk-taking index scores is consistent with several previous studies of occupational and military populations that found a similar relationship with other risk-taking measures. However, unexpectedly, training-related injury risk was also higher among males in the study sample with the lowest risk-taking index scores. This result suggests that males who are less willing to take risks may be at an increased risk of injury in the Army BCT environment. In this environment, in which numerous strenuous physical and mental tasks are required, a certain level of risk-taking may be advantageous.

As seen in other studies of Army populations, among both males and females, cigarette use was associated with injury, both overuse and traumatic. The association between cigarette smoking and overuse injuries may be related to the adverse physiologic effects of nicotine that delay wound healing (White, Pedersen et al. 1988; Amoroso, Reynolds et al. 1996; Knapik, Canham-Chervak et al. 1999), although longer-term effects such as lower bone density among female smokers (Amoroso, Reynolds et al. 1996; Centers for Disease Control and Prevention 2002) and connective tissue atrophy may also play a role. The link between cigarette use and traumatic injury is less clear, but the adverse effects of nicotine withdrawal (such as, difficulty concentrating and depression) may impair judgment enough to lead to behaviors, such as stepping into a pothole while running or inappropriately negotiating an obstacle, that could result in an acute injury.

Among females, it appears that the tendency to take health risks may have also been captured by the diet/lifestyle index, which was associated with training-related injury in this study. Whether these risks are taken knowingly or unknowingly is not known, but problem-behavior theory suggests that diet and lifestyle choices reflect adherence to norms of society, the value an individual places on health, if they believe health can be influenced by daily choices (internal health locus of control), and if their social support systems enhance or detract from routine healthy decision-making. Such tendencies towards riskier health decisions may translate among females into choices that increase their risk of training-related injury as well.

5. CONCLUSIONS. This study describes the distribution of health risk behaviors in an Army BCT population, tests the association of health risk behaviors with Army training-related injury, and represents the first assessment of the association of risk-taking with training-related injury. Among males, risk-taking as measured by prior self-reported health risk behaviors was associated with training-related injury while controlling for known risk factors such as physical fitness on entry to BCT. Both the lowest risk takers and highest risk takers were at increased risk of injury. Among females, injury risk was not associated with this measure of risk-taking. Cigarette use, however, was independently associated with training-related injury risk among both males and females, as has been seen in other Army populations.

6. RECOMMENDATIONS. To fully explore and understand the association of risk-taking with injury during Army BCT and beyond, additional research and epidemiologic analyses are needed. Intervening on potentially modifiable risk factors, such as smoking, should be explored to reduce the risk of training-related injuries.

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1. REFERENCES. See the end of the report for a complete list of references.

2. PURPOSE. Knowledge of behavioral risk factors for occupational injury, especially among working-age young adults, is limited. Additionally, physiologic risk factors for injury in military training populations have been well-established, while knowledge of behavioral risk factors for training-related injury in military populations is limited. This study examined the relationship between health risk behaviors and injury among a population of 1,902 young men and women who entered U.S. Army basic training between March and June 2003.

3. AUTHORITY. The Recruit Assessment Program (RAP) was established in response to Presidential Review Directive 5 (August 1998), which called for the establishment of “a Recruit Assessment Program to develop and maintain comprehensive electronic health and risk factor information on all recruits and officer accessions at the time of initial military training”. The pilot RAP was classified as research by the Human Subjects Research Review Board (HSRRB) of the U.S. Army Medical Research and Materiel Command, and was subsequently reviewed and approved (Protocol No. A-11674, *Pilot Survey of the Recruit Assessment Program (RAP) at Fort Jackson, South Carolina*). The protocol covering the analysis described in this report was initially reviewed and approved by the HSRRB (Protocol No. A-11674.2, *The Association of Health Risk Behaviors and Physical Fitness with Injuries and Attrition among U.S. Army Basic Trainees*) in April 2004.

4. INTRODUCTION.

a. Health Risk Behaviors: A Measure of Risk-Taking Tendency.

Health behaviors have been defined as “the combination of knowledge, practices, and attitudes that together contribute to motivate the actions we take regarding health” (Last 2001). Risk behaviors are those behaviors that can compromise one’s health or success in life (Jessor 1991); the term risk-taking behavior has been used to describe the same concept (Igra and Irwin 1996). Combining these terms, health risk behaviors refer specifically to health-related behaviors that can compromise an individual’s health and well-being. A familiar example of a health risk behavior is alcohol use, which has been linked to numerous adverse health and life-compromising outcomes such as cirrhosis, hemorrhagic stroke, cancer, and injury (U.S. Preventive Services Task Force 1996).

Health risk behaviors have been recognized as the true “root causes” of disease and injury, with behaviors such as tobacco use, poor diet and low physical activity levels, and alcohol use contributing to more than 800,000 deaths annually (McGinnis and Foege 1993). As the

importance of measuring health risk behaviors was recognized, large national datasets containing information on multiple risk behavior were established (for example, Behavioral Risk Factor Surveillance System in 1984, Youth Risk Behavior Surveillance System in 1989). These data enabled research on the effects of multiple health risk behaviors and the investigation of a growing number of theoretical discussions suggesting these behaviors co-occurred.

In the injury field, researchers have begun to use available information on multiple health risk behaviors to create measures of risk-taking tendency (Jovic, Vorko et al. 2001; Pickett, Garner et al. 2002; Pickett, Schmid et al. 2002). Risk-taking is a behavioral risk factor of persistent interest to the injury community, but to date has been investigated in only a few high-quality, published analytic studies (Turner, McClure et al. 2004). A systematic review of the literature from 1966-2002 found only seven analytic epidemiology studies that included risk-taking as a potential independent risk factor for unintentional injury (Turner, McClure et al. 2004). These previous studies were limited by reliance on self-reported injury data, cross-sectional survey design, convenience samples, or by use of only one behavior as an indicator of risk-taking tendency (Turner, McClure et al. 2004).

Even fewer studies of risk-taking and occupational injury risk have been done, despite the concern and suggestion that risk-taking contributes to occupational injury risk as well (Occupational Safety and Health Administration 1998; U.S. Department of Health and Human Services, August 1997). A number of occupational injury studies have measured safety behaviors, rather than injury, as an outcome (Farid and Lirtzman 1991; Salminen and Klen 1994; Alavanja, Sprince et al. 2001; Schenker, Orenstein et al. 2002; Reed, Westneat et al. 2003; Garcia, Boix et al. 2004). Of those studies in which injury or accidents were the outcome of interest, several focused on evaluating the role of perceived control (Janicak 1996; Greening 1997; Hechanova-Alampay and Beehr 2001), a contributing psychological factor described in a number of occupational injury conceptual models (Huang, Feuerstein et al. 2002).

Very few studies with an occupational injury outcome have included measures of risk-taking in their analyses. In a study by Kahn et al., analysis of ambulance crash data found a greater proportion of ambulance drivers involved in fatal crashes had prior motor vehicle crashes and prior motor vehicle convictions (measures of risky driving) compared to the general population (Kahn, Pirrallo et al., 2001). A study by Cohen et al., indicated that persons with a suspended or revoked drivers license were 2.3 times more likely to be involved in a ladder-related fall, although this relationship did not persist when controlling for ladder use behaviors and work environment (Cohen and Lin 1991). Although these studies suggest that risk-taking plays a role in occupational injury risk, conclusions are limited by the exclusion of the risk-taking measure from multivariate analyses (Kahn, Pirrallo et al. 2001) and use of only one surrogate measure of risk-taking (Cohen and Lin 1991).

More convincing evidence on the role of risk-taking with occupational injury risk is offered by Westaby et al. In their longitudinal assessment of injury among youth employed in agriculture, a survey was used to collect information on dangerous risk-taking and other factors, such as gender, prior injury, safety consciousness, safety knowledge, self-esteem, and leadership self-concept (Westaby and Lee 2003). Dangerous risk-taking, as measured by a five-item scale, had the strongest association with injury over time, leading to the authors' conclusion that individuals exhibiting high levels of dangerous risk-taking "are prime candidates for intervention" (Westaby

and Lee 2003). A study by Forrester et al., also found an index of non-occupational risk-taking behavior, as measured by alcohol use, non-use of seat belts, exposure to violence, use of a motorcycle, and drinking and driving history, was associated with occupational injury risk (Forrester, Weaver et al. 1996). The authors concluded that personal risk-taking behavior appeared to translate to risk-taking behavior in the occupational environment (Forrester, Weaver et al. 1996).

b. Risk-Taking and Occupational Injury: The Selected Study Population.

After a period of strong emphasis on environmental interventions, the injury field has once again begun to call for additional exploration of behavioral risk factors for injury (Bonnie, Fulco et al. 1998; Gielen and Sleet 2003). The effects of risk perception and risk-taking among subsets of the population at greatest risk of injury are of particular interest (Bonnie, Fulco et al. 1998) and the need for behavioral risk factor information is even greater for a less frequently-studies subset of injuries, those that are work-related (U.S. Department of Health and Human Services 1998; U.S. Department of Health and Human Services 2001; U.S. Department of Health and Human Services August 1997).

With over 1.4 million Active Duty Service members (Defense Medical Surveillance System 2005), the Department of Defense (DOD) is one of the largest employers and health care providers in the nation. Although medical surveillance data show that injuries have been a leading health problems for the U.S. military for decades (Jones, Amoroso et al. 1999), in recent years, that problem has come to the attention of policymakers at the highest levels of the DOD (Rumsfeld 2003). As a result, the U.S. military is keenly interested in understanding injury risk factors, and ultimately preventing injuries, reducing healthcare costs and attrition due to injury, and ensuring the “readiness” of military Service members (that is, the ability of the Service members to perform essential job duties).

As will be discussed in the next section, military populations, particularly those in training, experience high rates of injury. Demographic and physiologic risk factors for injury risk associated with military training have been well-documented, but little is known about the role of risk-taking behavior with injury risk in military populations. It has been suggested that injuries among U.S. Army Soldiers are, in part, due to a large number of “risk-takers” attracted to and enlisting in the U.S. Army (Rothberg, Bartone et al. 1990; Bell, Amoroso et al. 2000; Garvey Wilson, Lange et al. 2003; Knapik, Jones et al 2005). This study will explore this idea, as well as the relationship between risk-taking and training-related injury.

5. BACKGROUND and LITERATURE REVIEW.

For the nine weeks of basic combat training, trainees spend 24 hours a day with their peers and drill sergeants. The training received provides basic military occupational skills such as rifle marksmanship, hand-to-hand combat, and teamwork in negotiating physical obstacles. Improving physical fitness, agility, and confidence are key goals, as is education in Army standards of conduct and introduction to military traditions.

Individuals in Army basic combat training typically range in age from 17 to 35, although approximately 75 % (%) of trainees are between the ages of 17-20 (U.S. Army Accession

Medical Standards and Research Activity 2001); only a select few are allowed to enter basic training after age 35 if they had prior military service. The gender distribution in basic training is typically 60 % male and 40 % female, the majority of whom are white (49-56 %), followed by black (27-34 %) and Hispanic (6-24 %) (Knapik, Sharp et al. 1999; Canham-Chervak, Knapik et al. 2000; Knapik, Darakjy et al. 2005). Given that multiple studies of basic training have shown that the highest education level of approximately 80% of persons entering Army basic combat training is high school (Knapik, Sharp et al. 1999; Knapik, Darakjy et al. 2005) and the mean age of persons entering Army basic training is 20 years (Knapik, Sharp et al. 1999; Canham-Chervak, Knapik et al. 2000; Knapik, Darakjy et al. 2005), the adolescent health literature was reviewed to provide insight into health risk and risk-taking behaviors likely to be seen in the enlisted basic training population.

a. Risk-Taking among Adolescents and Young Adults.

A great deal of research on risk-taking, both theoretical and empirical, has been conducted in the area of adolescent health risk behaviors and risk-taking. While the age range of adolescence has been debated (Irwin, Burg et al. 2002), developers of “adolescent” health risk-taking theory have applied their theories to both high school (HS) and college-age individuals (Donovan and Jessor 1985; Donovan, Jessor et al. 1988; Severson, Solvic et al. 1993). National surveys and summaries of adolescent health data have also adopted a wide age range when describing adolescents; from 10-19 (MacKay, Fingerhut et al. 2000) and up to 21 years of age (Everett, Kann et al. 1997).

In searching for reasons for adolescent risk-taking, researchers have found biological, psychological, and social explanations for the greater propensity for risk-taking among adolescents. While social explanations for risk-taking (for example, peer pressure, desire to “fit-in”) are well known, it has also been suggested that neurologic changes in the prefrontal cortex and limbic regions of the brain during adolescence may also contribute to greater risk-taking behavior (Spear 2000). From a psychological standpoint, Steinberg suggests that adolescents’ greater propensity for risk-taking is due to underdeveloped self-regulation skills, skills that do not mature until early adulthood, and a concurrent desire for new and exciting experiences (Steinberg 2004). Kuther asserts that immature moral reasoning and a general egocentricity (“it’s my own business”) contributes to health risk-taking during adolescence (Kuther 2000).

Regardless of the underlying reasons for adolescent risk-taking behavior, there is recognition that some risk-taking during adolescence is “normal” and of value. Longitudinal studies have indicated that adolescent experimentation “paves the way to independence and to more mature, successful adult commitments” (Moore and Parsons 2000). Newcomb and Bentler found adolescent alcohol use to be associated with positive outcomes such as higher perceived social support and reduced loneliness (Newcomb and Bentler 1988). Shedler and Block observed that experimental drug (primarily marijuana) users were better adjusted and had better psychological functioning compared to non-users and heavy users (Shedler and Block 1990).

Despite some value to experimentation, numerous studies warn of the negative health effects and adverse life consequences resulting from chronic health risk behaviors established during adolescence. Data from the National Household Survey on Drug Abuse have indicated that adolescent smoking and alcohol use is related to poorer subjective measures of health and a greater number of hospitalizations (Johnson and Richter 2002). Cigarette use during adolescence

has been related to respiratory symptoms, reduced hardiness, psychosomatic complaints, and increased use of health services (Newcomb and Bentler 1987).

Among the adverse life consequences studied, a study by Hill et al. showed that, by age 13, heavy drinkers were less likely to be involved in clubs and other social activities, and had lower levels of parental bonding (Hill, White et al. 2000). Looking at longer-term effects, Horowitz found that alcohol use at age 21 was associated with delayed marriage and parenting, and lower marital success (Horowitz and White 1991). Use of cigarettes and hard drugs in HS has been directly related to dropping out of school prior to completion, lack of college attendance, employment at a younger age, and greater likelihood of being fired (Newcomb and Bentler 1986).

Furthering concern about adolescent health risk behaviors is the significant amount of scientific evidence that these behaviors co-occur. Studies have shown that negative health behaviors tend to cluster within individuals (Huizinga, Loeber et al. 1993; DiClemente, Hansen et al. 1996; Igra and Irwin 1996; Petridou, Zavitsanos et al. 1997; Brener and Collins 1998; Everett, Malarcher et al. 2000), forming a “risk behavior syndrome” (Jessor 1991; Gullone and Moore 2000). For example, in a study by Sabel et al., adolescents who reported drinking and driving and riding with a drinking driver also reported a higher quantity and frequency of drinking, more cigarette smoking and drug use, less seatbelt use, and gun carrying (Sabel, Bensley et al. 2004). In a study by Bachanas, teens reporting conduct problems and substance use also reported risky sexual behaviors (Bachanas, Morris et al. 2002). As might be expected, adolescents and young adults with multiple risk behaviors are more likely to experience negative health outcomes (Irwin, Burg et al. 2002).

Concerns about adolescent and young adult health risk behaviors have increased as links between early health behaviors and adult health have been demonstrated. Behaviors adopted in HS can persist during college (Wiley, James et al. 1997) and can affect one’s health status as an adult (Shedler and Block 1990; Centers for Disease Control and Prevention, Council of State and Territorial Epidemiologists et al. 2004). For example, health risk behaviors such as low physical activity or smoking, initiated during adolescence, have been shown to contribute to the development of chronic diseases, such as obesity and heart disease, in adulthood (Public Health Service 1994; Public Health Service 1994).

b. Health Risk Behaviors among U. S. Adolescents and Young Adults.

The prevalence of selected health risk behaviors in a nationally-representative sample of students in grades 9–12 is presented in Table 1. These data from the 2001 National Youth Risk Behavior Survey (YRBS) indicate that the prevalence of cigarette and alcohol use among U.S. adolescents is 28.5 % and 47.1 %, respectively (Grunbaum, Kann et al. 2002). One third (33.4 %) of students in grades 9–12 were currently sexually active (Grunbaum, Kann et al. 2002). YRBS data from 1991–2001 indicate that health risk behaviors such as the non-use of seat belts, drinking and driving, and sexual activity have declined over the last decade (Grunbaum, Kann et al. 2002). After a rise in cigarette and smokeless tobacco use in the early 1990s, declines in use have occurred since 1997 (Grunbaum, Kann et al. 2002).

Table 1. Prevalence of Selected Health Risk Behaviors among Students in Grades 9-12, National Youth Risk Behavior Survey, 2001 (Grunbaum, Kann et al. 2002)

| Behavior | Percentage (%) |
|--|----------------|
| Cigarette use before age 13 | 22.1 |
| Ever smoked \geq one cigarette every day for 30 days | 20.0 |
| Smoked \geq 1 day in previous 30 days | 28.5 |
| First drink before age 13 | 29.1 |
| \geq One alcoholic drink in past 30 days | 47.1 |
| Drove after drinking in past 30 days | 13.3 |
| Seat belt use (never or rarely worn) | 14.1 |
| Sex before age 13 | 6.6 |
| Sex in last 3 months | 33.4 |

Some general trends in health risk behaviors include that health risk behaviors are more prevalent among adolescent boys (Grunbaum, Kann et al. 2002), although at specific ages, certain risk behaviors may be more prevalent among girls (Stevens and Griffin 2001). For example, in a sample of 674 middle school students, a higher proportion of 13-year-old girls reported cigarette and alcohol use compared to 13-year-old boys (Stevens and Griffin 2001). Boys are also more likely to exhibit multiple health risk behaviors (Brener and Collins 1998; Duberstein Lindberg, Boggess et al. 2000; Stevens and Griffin 2001).

The prevalence of multiple risk behaviors increases with age among both boys and girls (Brener and Collins 1998; Duberstein Lindberg, Boggess et al. 2000; Stevens and Griffin 2001). The 1995 National Longitudinal Study of Adolescent Health indicated that 19 % of students in grades seven and eight engaged in two or more risk behaviors while 36 % of those in grades eleven and twelve engaged in two or more risk behaviors (Duberstein Lindberg, Boggess et al. 2000). In addition, risk behaviors vary according to ethnic group. During the 1990s, the prevalence of risk behaviors among Hispanic students decreased at a slower rate compared to the decrease in risk behaviors seen among white and black students (Duberstein Lindberg, Boggess et al. 2000). The proportion of Hispanic students engaging in multiple risk behaviors (five or more) also increased during this time period (Duberstein Lindberg, Boggess et al. 2000). The 2001 YRBS concluded that white and Hispanic students were significantly more likely than black students to report tobacco and alcohol use, while black students were more likely to have engaged in sexual intercourse (Grunbaum, Kann et al. 2002).

c. Injury and Injury Risk Factors in Adolescents and Young Adults.

Unintentional injury is the leading cause of death for persons aged 1 to 34 in the U.S. (Bensel and Kish 1983; Anderson 2001; Centers for Disease Control and Prevention, Council of State and Territorial Epidemiologists et al. 2004). More specifically, among adolescents (10-19 years of age), there are 15,000 deaths each year, or one injury death per hour in this country (Runyan and Gerken 1989; Vyrostek, Annet et al. 2004). Injuries are also a leading cause of medical visits (Ziv, Boulet et al. 1998); for every adolescent death, there are 41 hospitalizations and 1,100 emergency room visits (Centers for Disease Control and Prevention 1993). In 2001,

emergency department injury visit rates were highest for males and females aged 15-24 compared to all other age groups (Vyrostek, Annest et al. 2004). These injuries result in considerable costs; the Institute of Medicine estimated that, in 1995, 12 % of all medical care costs were due to injury, with total direct and indirect costs of injury reaching \$260 billion (Bonnie, Fulco et al. 1998).

Risk factors for adolescent injury include non-modifiable characteristics such as age, gender, and race (Paulson 1988; Runyan and Gerken 1989). However, health risk behaviors also play an important role. Behaviors such as the non-use of seat belts and helmets, speeding, alcohol use, tobacco use, and other health risk behaviors have been identified as risk factors for adolescent injury (Alexander, Ensminger et al. 1992; Kann, Kinchen et al. 2000; Mathews, Zollinger et al. 2001). Such risk behaviors are prevalent in adolescent populations (Cornell and Loper 1998; Leigh 1999; Kann, Kinchen et al. 2000) and injury risk is higher among those adolescents who participate in multiple health risk behaviors compared to those who do not engage in multiple health risk behaviors (Alexander, Ensminger et al. 1992; Pickett, Garner et al. 2002).

d. Occupational Injury and Injury Risk Factors in Adolescents and Young Adults.

Work-related injury rates are highest for persons 18-24 years of age compared to all other working-age adults (Smith, Wellman et al. 2005). The most current available estimates from national data sources indicate that, on average, 67 young workers die as a result of work-related injury each year (West, de Castro et al. 2005), and over 64,000 adolescent emergency department visits are attributable to work-related injury (Runyan and Zakocs 2000). Injuries can be severe; a review of studies of state-based workers compensation claim data and industry self-reported data indicated that between 15-45 % of adolescents with a work-related injury could not work for one day or more and between 15-44 % of injured adolescents sustained a permanent disability (Runyan and Zakocs 2000).

Although a number of national committees have identified a need for research on occupational injury risk factors among adolescents and young adults (National Research Council and the Institute of Medicine 2001; U.S. Department of Health and Human Services 2001; U.S. Department of Health and Human Services August 1997), work in this area remains limited. It is recognized that many of the adolescent tendencies discussed previously (for example, sensation-seeking, immature reasoning) increase adolescents' susceptibility to workplace injury (Runyan and Gerken 1989; Brezler 1999; Castillo, Davis et al. 1999; Wegman and Davis 1999; West, de Castro et al. 2005; U.S. Department of Health and Human Services August 1997). Other characteristics of adolescence, such as inadequate experience, desire to prove independence and maturity, vulnerability to peer pressure, and pressure to excel may all contribute to an adolescent's inability to appropriately reject, or their willingness to attempt, tasks they are not capable of accomplishing (Hobbs and Williamson 2002; West, de Castro et al. 2005; U.S. Department of Health and Human Services August 1997).

e. Occupational Injuries in the U.S. Army.

With more than half its population less than 30 years of age (Defense Medical Surveillance System 2005), given the previously-presented injury statistics, it may be no surprise that the U.S. Army has found non-combat, unintentional injuries to be one of its greatest health problems (Jones, Amoroso et al. 1999). Surveillance data provide evidence that unintentional injuries, during both peacetime and times of war, have consistently been a leading cause of death, disability, and hospitalization for the Army. From 1980-1994, unintentional injury was the leading cause of Active Duty Army personnel deaths (Helmkamp, Gardner et al. 1999). Over this same 14-year period, injury and musculoskeletal conditions were among the top four causes of Army Active Duty hospitalizations (Gardner, Amoroso et al. 1999).

As these data suggest, unintentional injuries result in significant costs to the Army. It is estimated that the Army medical department spent \$111 million for outpatient visits in the year 2000 (U.S. Army Patient Administration Systems and Biostatistics Activity 2001). Costs do not come in the form of medical expenses only, however. Loss of work time, loss of trained personnel, and disability compensation are also significant (Amoroso, Yore et al. 1999).

(1) Injuries during U. S. Army Basic Combat Training.

Beginning in 1980 and continuing through 2000, a series of studies looking at injuries during basic training documented cumulative injury rates (one or more injury visits) over the 8 or 9 week basic training period of 19-37 % for men and 42-67 % for women (Kowal 1980; Bense and Kish 1983; Jones, Bovee et al. 1993; Jones, Cowan et al. 1993; Westphal, Friedl et al. 1995; Knapik, Hauret et al. 2001; Knapik, Sharp et al. 2001). The most consistently demonstrated risk factor was a slow 2-mile run time as measured during the diagnostic Army Physical Fitness Test (APFT) administered at the start of basic training (Bense and Kish 1983; Jones, Bovee et al. 1993; Jones, Cowan et al. 1993; Knapik, Ang et al. 1993; Reynolds, Knapik et al. 1994; Reynolds, Heckel et al. 1994; Canham 1998; Knapik, Sharp et al. 1999; Knapik, Hauret et al. 2001). In the two studies in which the “gold standard” measurement of aerobic fitness, maximal oxygen consumption (VO_{2max}), were measured in Army basic trainees, low VO_{2max} was associated with higher cumulative injury rates during basic training (Jones, Manikowski et al. 1988; Knapik, Sharp et al. 1999). Other fitness variables that have been associated with basic training injuries include poor sit-up performance during the diagnostic APFT (Bense and Kish 1983; Jones, Bovee et al. 1993; Knapik, Ang et al. 1993; Reynolds, Knapik et al. 1994; Reynolds, Heckel et al. 1994; Canham 1998), poor push-up performance during the diagnostic APFT (Jones, Cowan et al. 1993; Knapik, Ang et al. 1993; Reynolds, Knapik et al. 1994; Reynolds, Heckel et al. 1994; Canham 1998; Knapik, Sharp et al. 1999), low levels of self-reported physical inactivity prior to basic training (Gardner, Dziados et al. 1988; Jones, Bovee et al. 1993; Jones, Cowan et al. 1993; Heir and Eide 1997), self-reported low physical fitness (Heir and Eide 1997; Shaffer, Brodine et al. 1999), extremes of flexibility (Jones, Cowan et al. 1993; Knapik, Sharp et al. 1999; Kaufman, Brodine et al. 2000), and prior injury (Jones, Cowan et al. 1993).

Other physiologic characteristics have also been identified as risk factors for injury during basic training. These include high arches (Giladi, Milgrom et al. 1985; Cowan, Jones et al. 1996;

Kaufman, Brodine et al. 2000), bowlegged-ness (Cowan, Jones et al. 1996), and either high or low body mass index (Jones, Bovee et al. 1993; Reynolds, Heckel et al. 1994; Heir and Eide 1997; Knapik, Sharp et al. 1999). In addition, women (Jones, Bovee et al. 1993; Canham 1998; Knapik, Sharp et al. 1999; Canham-Chervak, Knapik et al. 2000; Henderson, Knapik et al. 2000; Hauret, Shippey et al. 2001; Knapik, Hauret et al. 2001) and persons of older age (Gardner, Dziados et al. 1988; Jones, Cowan et al. 1993; Knapik, Ang et al. 1993; Heir and Eide 1997; Knapik, Sharp et al. 1999; Henderson, Knapik et al. 2000) have been shown to be at higher risk for injury during basic training.

(2) Health Risk Behaviors Associated with Injuries Among Military Personnel.

Behavioral risk factors associated with basic training injuries have been investigated to a lesser extent. Studies evaluating the effect of smoking on military training-related injury indicated that smokers have a 1.5 to 2.3 times greater risk of overuse injuries compared to nonsmokers (Jones, Cowan et al. 1993; Reynolds, Heckel et al. 1994; Heir and Eide 1997; Knapik, Sharp et al. 1999; Altarac, Gardner et al. 2000). Investigations of alcohol use and its association with injury have shown that injury risk during basic training increased with an increase in the reported number of days per week that alcohol was consumed prior to basic training (Westphal, Friedl et al. 1995). More recently, research on a broader population of Army personnel showed that younger age, low utilization of seat belts (0-50 % of the time), and heavy drinking (>21 drinks/week) were independently associated with motor vehicle accident-related injury hospitalizations (Bell, Amoroso et al. 2000).

f. Research Aims.

There are two main purposes of this study: (1) To provide insight into the distribution and relationship between health risk behaviors among enlisted U.S. Army trainees (Research Aim A) and (2) To investigate the association of health risk behaviors with a health- and potentially career-compromising outcome, injury during basic combat training (Research Aim B). Research Aim A consists of descriptive and exploratory analyses (Research Questions 1 and 2), which are followed by a series of multivariate regression analyses (Research Question 3) to address Research Aim B.

(1) Research Aim A: Understanding Health Risk Behaviors among Enlisted U.S. Army Basic Trainees.

Question 1: Describe the prevalence of health risk behaviors among U.S. Army trainees.

Hypothesis: Given that the median age of Army trainees is 19 years, health risk behaviors of incoming trainees will be similar to the prevalence of health risk behaviors reported among the general U.S. adolescent population.

Question 2: Investigate the patterns of health risk behaviors in this population.

Hypothesis 1: Health risk behaviors will be more prevalent among males compared to females.

Hypothesis 2: Health risk behaviors will co-occur in this study sample, as has been seen in other adolescent and young adult populations (that is, trainees engaging in one health risk behavior will be more likely to engage in additional health risk behaviors).

(2) Research Aim B.

Question 3: Examine the association of multiple health risk behaviors and risk of injury during basic training.

Hypothesis: Multiple health risk behaviors, as measured by a combined risk-taking index, will be associated with injury risk during Army basic combat training.

g. Theoretical Basis.

Existing occupational injury conceptual models were considered as potential theoretical guides for this work. However, the occupational injury models had minimal focus on the role of health risk behaviors; rather, these models focused on the association of injury with work factors (such as, lack of rest, repetition, and mechanical load), psychologic and social/organizational factors (such as, job stress, job control, and social support at work), and individual physiologic characteristics (such as, pre-existing disease or injury, age, gender) (Tanaka and McGlothlin 1993; Burdorf, Rossignol et al. 1997; Hagberg, Christiani et al. 1997; National Research Council and the Institute of Medicine 2001; Huang, Feuerstein et al. 2002). As was seen during the evolution of chronic disease epidemiology (Jessor 1991), it appears that individual human behavior is the last risk factor genre to be thoroughly considered and investigated in the field of occupational injury.

Sports injury conceptual models were also considered. While selected measures of individual risk-taking tendencies, such as motivation, have been incorporated (McIntosh 2005), other models lacked consideration of measures of individual health risk-taking behaviors (Norton, Schwerdt et al. 2001; Eime, Owen et al. 2004).

As a result, the conceptual framework for and much of the theory behind this study draws from the adolescent psychology literature, in which definitions of risk behavior and consequences of such behaviors have been discussed in-depth. Specifically, this study tests the association of health risk behaviors with an adverse health outcome, a link that was proposed by Jessor in his model of adolescent problem behavior (Jessor 1991).

Jessor's model is based on social/developmental psychology. He suggests that personality traits, such as a "risk taking propensity", are linked to risk behaviors and lifestyle choices, to include health risk behaviors. These health risk behaviors are subsequently linked to health and life-compromising outcomes (Figure 1). This study tested a portion of Jessor's model: the link between health risk behaviors and a health and life-compromising outcome, injury during basic training (Figure 2). Injury during basic training can be considered a health and life-

compromising outcome because of the potential for chronic medical problems that could result in disability, early termination of a military career, and decreased options for employment in the civilian workforce. Alternative models linking adolescent risk-taking with adverse health outcomes were considered (Alexander, Young et al. 1990; Zuckerman and Kuhlman 2000), however these models could not be tested using existing data available from the Army Recruit Assessment Program (RAP) survey.

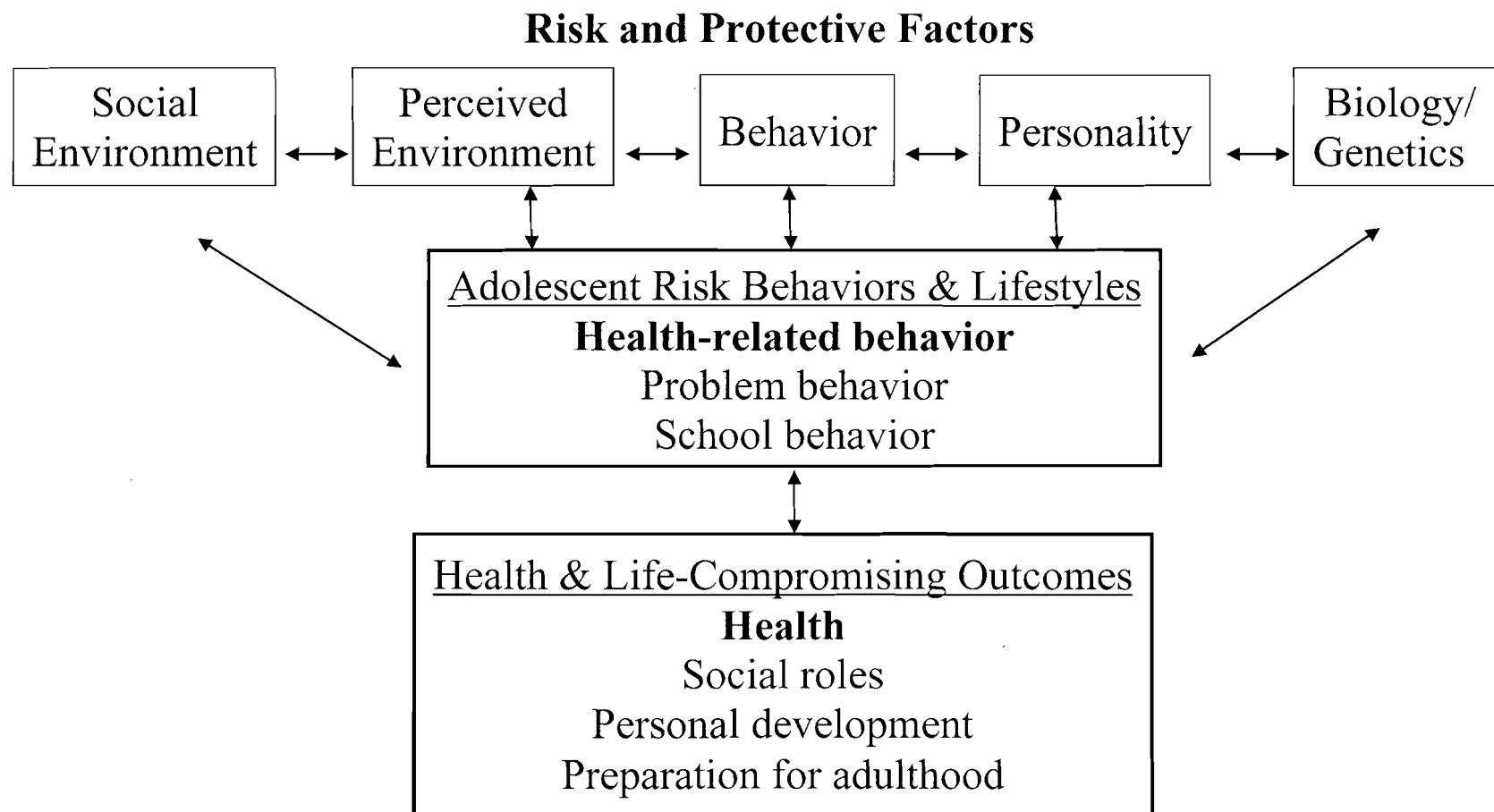


Figure 1. Factors Influencing Adolescent Risk Behavior and Subsequent Adverse Outcomes (Jessor 1991)
(Pathway of interest highlighted in **bold**)

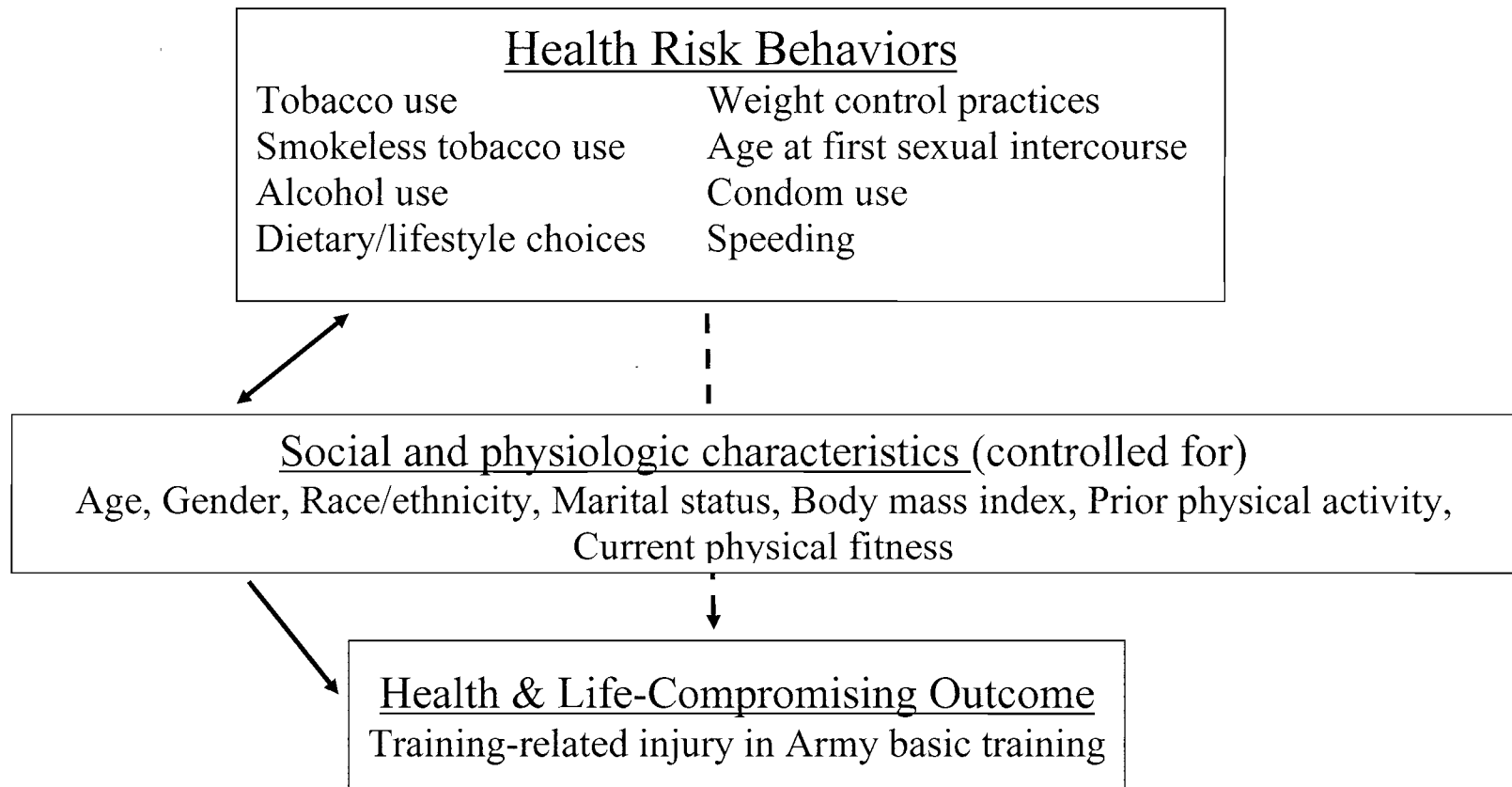


Figure 2. The Association of Selected Health Risk Behaviors and Training-Related Injury among Army Basic Trainees: An Adaptation of Jessor's Model

6. METHODS

a. Data sources

(1) Health Risk behaviors and demographics.

Health risk behavior data were obtained from a questionnaire that was administered as part of the U.S. Army RAP Pilot Study at Fort Jackson, South Carolina. Men and women entering enlisted basic training at Fort Jackson between October 2002 and May 2004 received an informed consent briefing on the pilot study within the first 4 days of their arrival to Fort Jackson Reception Station and prior to the initiation of basic training. The briefing was given by civilian research assistants; superiors were not allowed in the room during this time. Those who volunteered to participate were given 40 minutes to complete the questionnaire. Those who did not volunteer remained seated in the room for this time period. Data collected by the questionnaire included demographic information, work history, medical history, and mental health measures. Health risk behaviors captured by the questionnaire included tobacco and alcohol use, eating habits, sexual history, driving habits, methods of weight control used, and prior physical activity.

The questionnaire used during the Army RAP Pilot Study (Appendix A) was modeled after the questionnaire used by the U.S. Navy Recruit Assessment Program. Development of the Navy's questionnaire began in 1998 in response to a call from the Institute of Medicine (Institute of Medicine 1995) and several other scientific review panels (Department of Defense 1994; NIH Technology Assessment Workshop Panel 1994; Presidential Advisory Committee on Gulf War Veterans' Illnesses 1996) for a more comprehensive collection of health and exposure data on U.S. military personnel; these recommendations resulted in response to the lack of information on exposures prior to and during the Persian Gulf War. A collaborative effort between the Department of Defense (DOD), Department of Veterans Affairs, and Department of Health and Human Services produced a questionnaire designed to assess baseline health characteristics of incoming recruits (Ostroff and Riddle 2002). In September 2002, the Armed Forces Epidemiology Board reviewed the RAP and issued a recommendation to the Assistant Secretary of Defense for Health Affairs to administer the RAP DOD-wide (Ostroff and Riddle 2002). A revised RAP survey (renamed the Health Assessment Research Tool for Accessions, or HART-A) is currently under DOD review. Plans suggest that the HART-A will be made available to epidemiologists and policy makers to assist in health promotion resource planning as well as to health care providers to assist with individual health counseling.

Comparability to other data sources was a priority (Hyams, Barrett et al. 2002); thus the designers of the original RAP questionnaire incorporated questions from validated survey instruments and a number of standard DOD medical data collection tools. The sources included the DOD Standard Form 93, the DOD Medical Outcomes Short Form (SF-12/36), the DOD Health Enrollment Assessment Review 2.0, the Revised DOD History Opinion Inventory, the Youth Risk Behavior Survey, the Alcohol Use Disorders Identification Test (AUDIT), the CAGE alcohol use survey, the National Comorbidity Study, and the PRIME-MD patient questionnaire (Young 2003).

The RAP questionnaire was piloted by the Naval Health Research Center (NHRC) at the Marine Corps Recruit Depot (MCRD), San Diego, California. The NHRC conducted two separate focus group tests to identify difficulties with individual questions and the questionnaire in general. Results of the focus group testing led to the addition of two questions, the elimination of 23 repetitive or unnecessary questions, and the modification of 21 questions that were difficult to understand or did not include appropriate answers (Lane, Young et al. 2000). Reliability was assessed using a test-retest procedure with a sample of 195 Marine recruits (Lane, Young et al. 2000). The Kappa coefficient for the overall questionnaire was 0.93, with a range of 0.84-0.97 among the 12 sections of the questionnaire (Lane, Young et al. 2000).

The RAP questionnaire has been a part of recruit in-processing at the MCRD San Diego since June 2001. Changes since the Navy pilot test included rewording of particular questions with low response rates (Young 2002) and the addition of questions taken from the Adverse Childhood Experiences Study (Felitti, Anda et al. 1998). The questionnaire, with these changes, was adapted for use by the Army RAP Pilot Study in May 2002. A test-retest reliability analysis of the Army questionnaire showed acceptable reliability (Kappa coefficients ≥ 0.6) for all but the last section (Section 9) of the questionnaire (Canada, Canham-Chervak et al. 2005). Questions from this section were not used in this study.

(2) Physical Fitness and Time-in-Training.

Physical fitness data are not captured in a surveillance system, so available data were limited to a subset of Fort Jackson trainees on whom Army Physical Fitness Test (APFT) data were previously collected by the USACHPPM Injury Prevention Program as part of a physical training program evaluation (Knapik, Darakjy et al. 2004). The sample consisted of approximately 3,500 recruits who entered three different basic training battalions at Fort Jackson between March and June 2003.

The APFT consists of three events: (a) a 2-mile run for time, (b) push-ups completed in a 2-minute time period, and (c) sit-ups completed in a 2-minute time period. Run time on the APFT has been shown to be a valid surrogate for the “gold standard” measurement of aerobic fitness, VO_{2max} (Knapik 1989). Performances on the push-up and sit-up events, measures of muscle endurance, are less correlated with “gold standard” measures of muscle endurance (Knapik 1989), but have been routinely included in investigations of fitness and injury in Army populations and have been associated with training-related injury risk in past studies. APFT data used in this study are from the first APFT test, administered within the first week of basic training, which represents physical fitness upon entry to training. As part of the APFT, data on height and weight are also collected; these data were also obtained to allow for calculations of body mass index (BMI).

Attrition data collected from the basic training units as part of the program evaluation were also obtained in order to calculate time-in-training for each trainee. Potential reasons for leaving the basic training unit prior to completion of the 9-week training cycle; (1) discharge from the Army or (2) transfer to another basic training unit. Discharges occurred for medical, motivational, and other reasons. Transfers occurred because of inability to complete mandatory training requirements according to the required unit schedule due to injury, emergency leave, lack of motivation, or a problem mastering a particular skill. Due to the rigidity of the basic training schedule, trainees who could not keep up with the pace of their current unit were required to change units so that missed or incomplete training could be repeated. Although basic training units typically accept additional trainees throughout the training cycle, during the course of the program evaluation this was not allowed in these units.

(3) Injury.

Injury data were obtained from the Army Medical Surveillance Activity (AMSA), a program within the USACHPPM responsible for maintaining the Defense Medical Surveillance System (DMSS). As mandated by DOD Directive 6490.2, AMSA routinely receives, cleans, manages, and maintains electronic medical data for all inpatient and outpatient medical encounters for all Active Duty Service members. Inpatient and outpatient injury data were obtained on the sample for which APFT data were also available. Variables requested included hospitalization or outpatient visit dates, primary and secondary diagnoses, and disposition upon discharge from the treatment facility (for example, discharged with or without work limitations). Diagnoses were recorded according to codes available in the International Classification of Disease, Ninth Edition, Clinical Modification (ICD-9-CM). Gender, date of birth, height, weight, and military pay grade were also requested and used to compare to RAP data to validate results of the data linkage and replace missing data when necessary.

b. Creation of Health Risk Behavior Indices.

Twenty-three health risk behaviors were selected for consideration for inclusion in the health risk behavior indices (Table 2). These behaviors represented the following key categories of health risk behaviors: tobacco use, alcohol use, sexual behaviors, injury-related behaviors, and diet and general health behaviors. Since prior fitness was intended to be a covariate in future multivariate analyses due to its association with injury in studies of military training (Gardner, Dziados et al. 1988; Jones, Bovee et al. 1993; Jones, Cowan et al. 1993; Heir and Eide 1997), it was excluded from consideration for the indices. The selected behaviors were chosen based on their consistent classification in the literature as “risky”, or putting an individual at risk for adverse health outcomes (Donovan, Jessor et al. 1988; Jessor 1991; Meschke 1998; Flay, Petraitis et al. 1999; Zuckerman and Kuhlman 2000; Centers for Disease Control and Prevention, Council of State and Territorial Epidemiologists et al. 2004; Flay, Graumlich et al. 2004; Ozer, Adams et al. 2004), including injury (Alexander, Ensminger et al. 1992; Sabel, Bensley et al. 2004; Smith-Khuri, Iachan et al. 2004). Whenever possible, measures of frequency, intensity, and duration were included.

Table 2. RAP Questions Considered for Inclusion in Health Risk Behavior Indices

| Health Risk Behavior | Question(s) on RAP questionnaire |
|-------------------------------------|--|
| Tobacco Use | |
| Age at First Cigarette Use | Section 6, Question 4: At what age did you first start smoking regularly (meaning, you smoked most days)? |
| Cigarette Use – Frequency | Section 6, Question 5: How many years did you smoke more than 3 cigarettes on most days? |
| Cigarette Use – Intensity | Section 6, Question 6: When you were smoking regularly, how many packs did you smoke each day? |
| Smokeless Tobacco Use - Frequency | Section 6, Question 9: How many years did you use smokeless tobacco (chew, dip, snuff) on most days? |
| Smokeless Tobacco Use – Intensity | Section 6, Question 10: When you were using smokeless tobacco regularly, how many cans did you use each day? |
| Alcohol Use | |
| Age At First Drink | Section 7, Question 2: How old were you when you first had a drink containing alcohol? |
| Alcohol Use – Lifetime Duration | Section 7, Question 3: How many years have you been drinking alcoholic beverages on a regular basis? |
| Sum of First Three AUDIT Questions* | Section 7, Questions 4-6: During the year (12 months) before entering the military, how often did you have a drink containing alcohol? During the past year, how often did you have 6 or more drinks at one sitting? During the past year, how many drinks containing alcohol did you have on a typical day of drinking? |
| Sum of CAGE Questions* | Section 7, Questions 9-12: Did you ever feel as though you needed to cut down on your drinking [during the past year]? Did you ever feel annoyed because someone in your life said you needed to cut down on your drinking [during the past year]? Did you ever felt guilty after drinking [during the past year]? Did you ever need a first drink, or eye-opener, in the morning following a day or night of heavy drinking [during the past year]? |
| Drunk Driving | Section 7, Question 14: Have you ever driven a car within 2 hours of drinking two or more alcoholic drinks [during the past year]? |

*Creation of summary AUDIT and CAGE questions described in next section

Table 2. RAP Questions Considered for Health Risk Behavior Indices (continued)

| Health Risk Behavior | Question(s) on RAP questionnaire |
|--|---|
| Motor Vehicle Injury-Related Risk Behaviors | |
| Speeding | Section 9, Question 6: How many traffic tickets for moving violations have you ever received (such as speeding or running a red light)? |
| Seat Belt Use | Section 9, Question 7: How often do you wear a seat belt when driving or riding in a car? |
| Sexual Health Risk Behaviors | |
| Age at First Sexual Intercourse | Section 9, Question 8: How old were you when you had sexual intercourse for the first time? |
| Condom Use | Section 9, Question 9: Did you or your partner use a condom (rubber) the last time you had sex? |
| STD Diagnosis | Section 9, Question 10: Have you ever been told by a doctor or nurse that you had a sexually transmitted disease or STD? |
| Diet and Other Health Risk Behaviors | |
| Sleep | Section 8, Question 1: About how many hours did you sleep on most nights [during the past year]? |
| TV | Section 8, Question 2: About how many hours did you watch TV (television) on an average day [during the past year]? |
| Caffeine Use | Section 8, Question 3: On an average day [during the past year], about how many cups, bottles, or cans of drink with caffeine did you drink? |
| Fast Food Consumption | Section 8, Question 4: About how many times each week [during the past year] did you eat from a fast food restaurant? |
| Breakfast | Section 8, Question 5: About how often each week [during the past year] did you eat breakfast? |
| Diet Pill Use | Section 8, Question 9: Have you ever taken diet pills to lose weight? |
| Laxative Use | Section 8, Question 10: Have you ever used laxatives to lose weight? |
| Vomiting to Lose Weight | Section 8, Question 11: Have you ever caused yourself to vomit to lose weight? |
| Steroid Use | Section 8, Question 12: Have you ever used steroids to gain weight or increase muscle strength? |

(1) AUDIT and CAGE Scoring.

Two measures of alcohol use in the RAP questionnaire required the assignment of point values to individual questions and the calculation of a total score. The first of these measures were questions taken from the Alcohol Use Disorders Identification Test (AUDIT), a ten-item survey designed by the World Health Organization (WHO) to assess hazardous alcohol use in primary care settings (Conigrave, Hall et al. 1995). The AUDIT has been found to be a reliable and valid measure of risky drinking (Centers for Disease Control and Prevention 2003), even when imbedded in a general health questionnaire (Daeppen, Yersin et al. 2000), and predictive of alcohol-related social problems (Conigrave, Saunders et al. 1995).

Although it would have been preferable to calculate a score based on the full 10-item AUDIT survey, this was not possible since only six of the original AUDIT questions were present in the RAP questionnaire. As a result, a score based on the first three questions was calculated. This three-question version, the AUDIT-C, was previously developed to save time in primary care and emergency room settings (Nordqvist, Johansson et al. 2004; Dawson, Grant et al. 2005). The AUDIT-C has since been deemed a useful screening tool that performs well across various population subgroups (Nordqvist, Johansson et al. 2004; Dawson, Grant et al. 2005), though it is less effective than other screening tools at identifying alcohol abuse and alcoholism (National Institute on Alcohol Abuse and Alcoholism 2002).

For this analysis, responses to the first three AUDIT questions in the RAP questionnaire were each assigned a score of 0 to 4 (Table 3), as was done in the original AUDIT questionnaire (Babor, de la Fuente et al. 1992), so that the range of the sum of these three questions was 0 to 12. While various cut points have been debated (Nordqvist, Johansson et al. 2004; Dawson, Grant et al. 2005), a cut point of greater than or equal to five was shown to be as sensitive as the full AUDIT questionnaire in detecting “hazardous drinkers” (Gordon, Maisto et al. 2001), that is, persons displaying a “repeated pattern of drinking that confers the risk of harm” (Saunders and Lee 2000). A dichotomous variable representing those below and equal to or above the selected cut point was created as a measure of hazardous drinking behavior. This dichotomous variable is used in further analyses.

Table 3. Questions and Scores Assigned to Responses to First Three AUDIT Questions

| AUDIT question from RAP questionnaire | Score |
|---|-------|
| In past year, how often had alcoholic drink | |
| Never | 0 |
| Once/twice* | 1 |
| A few times* | 1 |
| Monthly | 2 |
| Weekly | 3 |
| Daily | 4 |
| In past year, how often ≥ 6 drinks at one sitting | |
| Never | 0 |
| Once/twice* | 1 |
| A few times* | 1 |
| Monthly | 2 |
| Weekly | 3 |
| Daily | 4 |
| In past year, number of alcoholic drinks on typical day of drinking | |
| None | 0 |
| 1-2 | 0 |
| 3-4 | 1 |
| 5-6 | 2 |
| 7-9 | 3 |
| 10 or more | 4 |

*In other versions of the AUDIT, the comparable response choice is “Less than once a month” (Nordqvist, Johansson et al. 2004) or “Monthly or less” (Babor, de la Fuente et al. 1992; Gordon, Maisto et al. 2001).

All four questions of another commonly-used alcohol use screening tool, the CAGE, were also included in the RAP questionnaire. The CAGE has been deemed superior to the AUDIT for detecting alcohol abuse and dependence (Bradley, Bush et al. 1998; Fiellin, Reid et al. 2000; National Institute on Alcohol Abuse and Alcoholism 2002), though it may not detect “low but risky” levels of drinking (Fiellin, Reid et al. 2000; National Institute on Alcohol Abuse and Alcoholism 2002). Like the AUDIT, various cut points have been used (Fiellin, Reid et al. 2000; McCusker, Basquille et al. 2002), but clinicians have argued that even one positive response indicates a potential alcohol problem (Ewing 1998). Studies have reported respectable sensitivity (60-70 %) and specificity (84-88 %) using a cut point of one (Fiellin, Reid et al. 2000). As a result, data were analyzed and presented with this cut point in mind.

Scoring of the CAGE questions followed the standard procedure of assigning one point for every question to which a “yes” response was reported (Ewing 1998, McCusker, Basquille et al. 2002) (Table 4). Total (summed) CAGE scores ranged from 0 to 4. A dichotomous variable representing those below and equal to or above the selected cut point of one was created as a measure of potential alcohol abuse and dependence. This dichotomous variable is used in further analyses.

Table 4. Questions and Scores Assigned to Responses to CAGE Questions

| CAGE question in RAP questionnaire | Score |
|--|-------|
| Did you ever feel as though you needed to cut down on your drinking? | |
| Never | 0 |
| Yes, but more than 1 year ago | 1 |
| Yes, during the past year | 1 |
| Did you ever feel annoyed because someone in your life said you needed to cut down on your drinking? | |
| Never | 0 |
| Yes, but more than 1 year ago | 1 |
| Yes, during the past year | 1 |
| Did you ever felt guilty after drinking? | |
| Never | 0 |
| Yes, but more than 1 year ago | 1 |
| Yes, during the past year | 1 |
| Did you ever need a first drink, or eye-opener, in the morning following a day or night of heavy drinking? | |
| Never | 0 |
| Yes, but more than 1 year ago | 1 |
| Yes, during the past year | 1 |

(2) Factor Analysis.

Factor analysis was used to determine if and how the individual health risk behavior questions could be grouped. Analysis focused on results for men and women combined (n=1,902). Principle components analysis was chosen over other factor analyses techniques since data reduction and exploration of the interdependence among variables was desired (Kim and Mueller 1978). Since the variables entering the factor analysis consisted of varying scales, correlation matrices formed the basis of the analysis (Kim and Mueller 1978). Results of orthogonal rotations are reported, although oblique rotations were also run for comparison purposes. Cases were excluded if missing values existed for one or both of the pair of variables in computing a specific statistic. The number of components was determined by evaluating the eigenvalues (retained if eigenvalue ≥ 1.0) and scree plot. Internal consistency of the final components was assessed using Cronbach's alpha (with ordinal variables) or the Kuder-Richardson 20 (KR20) coefficient (with dichotomous variables). Values were evaluated using cut points suggested by Fleiss (Fleiss 1981) (poor/good/excellent: $<0.40/0.40-0.75/>0.75$). When statistical significance of the internal consistency measure did not improve with removal of a variable, the variable was maintained in the index.

(3) Index Scoring.

Following identification of appropriate individual health risk behavior indices, scores were calculated for each index based on item responses within each index (Table 5). Scores were assigned based on health risks; item responses thought to convey the greatest health risks were given a score of two, item responses conveying moderate health risk were given a score of one,

and item responses conveying little or no health risk were given a score of zero. Thus, a higher score represented greater reported participation in behaviors posing threats to health and well-being. As an example, if a trainee reported never smoking regularly, they would receive a score of zero for each of the items in the cigarette use index, and thus a total score of zero for that index. If a trainee started smoking before age 21, but smoked regularly for a year or less and smoked less than a half pack a day, their total score for the cigarette use index would be four. When only one response was missing from the questions used to create the index, a total index score was calculated using available responses.

Once total scores for each index were obtained, the scores were standardized to a 60-point scale so that each health risk behavior index would have equal weight in the combined risk-taking index. To achieve the standardized scores, scores from indices consisting of three items were multiplied by 10, scores from indices consisting of five items were multiplied by 6, and scores from the index consisting of two items were multiplied by 15. In addition to the continuous summed value, total standardized scores for each index were also divided into low (0-20 points), medium (21-40 points) and high (41-60 points) risk categories. Relationships between risk indices were evaluated by gender using Spearman rank order correlations.

A combined risk-taking index (300 possible points) was then created by summing the standardized scores of the five indices. In addition to the continuous summed value, a gender-specific four-category variable (lowest/average/higher/highest risk-taking) was created based on the distance from the mean combined risk-taking index score.

Table 5. Characteristics of Low/Medium/High Risk Categories for Five Individual Health Risk Behavior Indices

| Index | Question/item | Specific Item Responses Associated Each Risk Category | | |
|---------------------------------------|---------------------------|---|--|--------------------|
| | | Score=0 | Score=1 | Score=2 |
| Cigarette use ¹ | Age at first use | Never smoked regularly | ≥ 21 years old | <21 years old |
| | Years smoked | Never smoked regularly | 1 year or less | 2 or more years |
| | Packs smoked | Never smoked regularly | 1/2 pack or less/day | 1 pack or more/day |
| Smokeless tobacco use ² | Number of cans/packs used | Never used regularly | 1/2 can or less/day | 1 can or more/day |
| | Years used | Never used regularly | 1 year or less | 2 or more years |
| Alcohol use ³ | Age at first drink | Have never had a drink | 21 years or older | 9-20 years old |
| | Years been drinking | Have never had a drink | Just tried a few times, 1 year or less | 2 or more years |
| | Drinking and driving | Never | -- | Yes |
| | CAGE score | 0 | -- | 1-4 |
| | AUDIT-C score | 0-4 | -- | 5-12 |
| Diet/lifestyle choices ³ | Hours of TV viewing | None | 1 to 3 hours/day | 4+ hours/day |
| | Caffeinated beverages | None - 3 | 4 to 5 | 6+/day |
| | Fast food consumption | None-2 to 3 times/wk | 4-7 times/week | 8+ times/week |
| | Breakfast | 5-7 mornings | 1-4 mornings | Never |
| | Seat belt use | Always | Usually, Sometimes | Never |
| Weight control practices ¹ | Diet pill use | No | (none) | Yes |
| | Laxative use | No | (none) | Yes |
| | Vomiting | No | (none) | Yes |

¹ Multiplied by a factor of 10 to standardize to a 60-point scale² Multiplied by a factor of 15 to standardize to a 60-point scale³ Multiplied by a factor of 6 to standardize to a 60-point scale

c. Additional Data Coding and Preparation for Analyses.

The following section describes the re-coding and grouping of social and physiologic covariates and the injury outcome variables. All data management and descriptive statistical analyses were conducted in SPSS version 13.0.1 (SPSS, Inc., Chicago, IL).

(1) Social and Physiologic Covariates.

Divorced, widowed, married but separated, and trainees living with a significant other (2.5 % of the total sample) were grouped with married trainees based on similarities in mean age (mean age = 24.7 years and 26.8 years, married and other, respectively). Selected education levels (split option and no HS; HS and trade/technical school; some college, 4-year college, and advanced degrees) were also grouped. The variable capturing component (Regular Army, Army Reserves, and Army National Guard) was collapsed into two categories: Regular Army and Reserves/National Guard. Regular Army, also called Active-Army, reflects individuals who do not enter the Army through the Reserves or National Guard. As in national samples of young adults (Grunbaum, Kann et al. 2002), the number of persons identifying themselves as “other” race/ethnicity (7.4 %) was too small for meaningful analysis. These individuals were omitted from race-specific bivariate and multivariate analyses.

The APFT results (run time minutes, number of push-ups completed, and number of sit-ups completed) were kept as continuous variables, but were also divided into gender-specific quartiles for certain analyses. BMI was calculated from height and weight using the following equation: $\text{weight(kg)/height(m)}^2$. BMI was kept continuous, but also divided into categories of “underweight” (BMI<18.5), “normal” (18.5-24.9), “overweight” (25.0-29.9), and “obese” (30.0 or higher) according to established cut points (Centers for Disease Control and Prevention 2005).

(2) Injury Outcomes.

A training-related injury was defined as any inpatient or outpatient medical encounter captured in the DMSS with a primary diagnosis code matching a pre-defined list of ICD-9-CM codes representing training-related injuries (Appendix B). This set of codes was developed for use in investigations of Army training-related injuries that obtain injury outcome data from DMSS (Knapik, Darakjy et al. 2004). A subset of these codes is currently used to track and report injuries sustained by Active Duty military personnel (U.S. Army Center for Health Promotion and Preventive Medicine 2004) and yet another subset is used, more specifically, to track and report training-related injuries among training populations (unpublished). Diagnosis codes were grouped into major ICD-9-CM categories (for example, Injuries and Poisonings, 800-999) for some descriptive analyses.

The ICD-9-CM code list used in this study (Appendix B) included selected chronic musculoskeletal conditions and a few neurologic conditions and dermatologic conditions that, from extensive field investigation evidence and experience of military clinicians and injury researchers, were determined to be primarily training-related when observed in basic training populations. For example, running, marching, and other lower-extremity load-bearing activities associated with military occupational training have been identified as leading causes of Army

outpatient injury visits (Jones, Cowan et al. 1994; Knapik, Bullock et al. 2003) and reductions in running mileage, in particular, have resulted in fewer training-related injuries (Almeida, Williams et al. 1999; Knapik, Hauret et al. 2001; Knapik, Hauret et al. 2003; Knapik, Darakjy et al. 2004; Knapik, Darakjy et al. 2005). For this reason, conditions associated with overuse due to military physical training and classified using ICD-9-CM Musculoskeletal Conditions codes, such as ingrown toenails (ICD-9-CM code 703.0) and joint dislocations (ICD-9-CM code 718), are included in the definition of training-related injury.

The code list used in this study differs from codes lists used in previous Army training-related injury studies in one way: four selected ICD-9-CM injury-related treatment (“V”) codes were added after a detailed review of the data suggested that some injury-related medical encounters might never have received an ICD-9-CM diagnosis code, but rather were only assigned a V-code. To enhance the capture of all injury-related diagnoses, the following codes from the ICD-9-CM V-code list were added to the previously-established list of “training-related injury” codes: V54.19 (Aftercare for healing traumatic fracture of other bone), V54.89 (Other orthopedic aftercare), V57.1 (Other PT), and V57.21 (Encounter for occupational therapy). This resulted in the addition of 367 visits coded as injury-related. The total number of persons injured did not change however, suggesting that most of these visits were follow-ups.

Injuries were further classified as overuse or traumatic following previously-established conventions (Knapik, Darakjy et al. 2004) and consistent with definitions of overuse and traumatic injuries used in prior Army training-related injury investigations (Jones, Bovee et al. 1993; Jones, Cowan et al. 1993; Canham 1998; Knapik, Canham-Chervak et al. 1999; Canham-Chervak, Knapik et al. 2000; Knapik, McCollam et al. 2000; Knapik, Canham-Chervak et al. 2001; Knapik, Hauret et al. 2001; Knapik, Sharp et al. 2001; Knapik, Hauret et al. 2003). A fourth injury variable, an indicator of injury severity, was also created. This variable categorized injuries according to whether the Soldier was discharged from medical care with or without work limitations. Information on the number of days of work limitation was not available.

Since injuries often result in multiple medical encounters, visits were also classified into initial (first) visits for an injury and follow-up visits for an injury in order to obtain an accurate count of “unique (incident) injuries”. An exact repeat of an ICD-9-CM diagnosis code was coded as a follow-up visit if it occurred within 30 days of the previous code, a method consistent with definitions of follow-up used when reporting DMSS data (Army Medical Surveillance Activity 2005). Further data review indicated that a large number of visits had slightly different diagnoses codes within the same major code category or between injury-related major cause categories (that is, Diseases of the Musculoskeletal System and Connective Tissue, 710-739, and Injuries and Poisonings, 800-999), as occurs when different providers are seen at each visit or providers revise previous diagnoses based on new medical information (see Table 6 for examples). As a result, the following visit types were also coded as follow-ups: (1) visits within 30 days of each other and within the same major diagnostic category as a previous visit, and (2) visits within 30 days of each other, within an injury-related major diagnostic category, and within the same body region (such as, lower, upper). The first coding decision captured visits receiving slightly different codes from providers (such as, 719.40 and 719.46). The second

coding decision captured visits for an injury in the same body region, but with diagnoses across injury-related major diagnostic groups (see examples 4 and 5 in Table 6). The coding algorithm also allowed for the capture of follow-ups that occurred when there were intervening visits for other conditions. Manual review of an approximately 10 % random sample (n=536 visits) indicated that only 0.4 % of the visits received an inappropriate code using this methodology.

Table 6. Examples of Defense Medical Surveillance System Injury Visits and Follow-up Coding

| ID# | Visit date | Follow Up 0=No 1=Yes | ICD-9 Code and Description |
|-----|---|----------------------------|---|
| 1 | Example of (1) injury diagnoses variation within major code category and (2) use of V-codes for injury follow-up visits | | |
| | 21-JUL-2003 | 0 | 719.45 Pain In Joint Involving Pelvic Region and Thigh |
| | 29-JUL-2003 | 1 | 719.46 Pain In Joint Involving Lower Leg |
| | 29-JUL-2003 | 1 | V57.1 Other Physical Therapy |
| | 11-AUG-2003 | 1 | V57.1 Other Physical Therapy |
| | 26-AUG-2003 | 1 | V57.1 Other Physical Therapy |
| 2 | Example of (1) injury diagnoses variation within major code category and (2) use of V-codes for injury follow-up visits | | |
| | 10-MAY-2003 | 0 | 717.7 Chondromalacia Of Patella; Degeneration of articular cartilage of patella |
| | 17-MAY-2003 | 1 | 719.46 Pain In Joint Involving Lower Leg |
| | 19-MAY-2003 | 1 | V57.1 Other Physical Therapy |
| 3 | Example of (1) injury diagnoses variation within major code category and (2) use of V-codes for injury follow-up visits | | |
| | 08-APR-2003 | 0 | 815.00 Closed Fracture of Metacarpal Bone(s), Site Unspecified |
| | 08-APR-2003 | 1 | 829.0 Fracture of Unspecified Bone, Closed |
| | 15-APR-2003 | 1 | V65.43 Counseling on injury prevention |
| | 22-APR-2003 | 1 | V65.43 Counseling on injury prevention |
| | 22-APR-2003 | 1 | V54.19 Aftercare for healing traumatic fracture of other bone |
| | 22-APR-2003 | 1 | V67.4 Following treatment of healed fracture |
| | 29-APR-2003 | 1 | V54.89 Other orthopedic aftercare |
| | 29-APR-2003 | 1 | V65.43 Counseling on injury prevention |
| | 06-MAY-2003 | 1 | V54.19 Aftercare for healing traumatic fracture of other bone |
| | 06-MAY-2003 | 1 | V65.43 Counseling on injury prevention |
| | 07-MAY-2003 | 1 | V65.43 Counseling on injury prevention |
| | 08-MAY-2003 | 1 | V65.43 Counseling on injury prevention |
| | 13-MAY-2003 | 1 | V65.43 Counseling on injury prevention |
| | 19-MAY-2003 | 1 | 815.00 Closed Fracture of Metacarpal Bone(s), Site Unspecified |
| | 19-MAY-2003 | 1 | V67.4 Following treatment of healed fracture |
| | 20-MAY-2003 | 1 | V65.43 Counseling on injury prevention |

Table 6. Examples of Defense Medical Surveillance System Injury Visits and Follow-up Coding (continued)

| ID# | Visit date | Follow Up 0=No 1=Yes | ICD-9 Code and description | |
|-----|--|----------------------------|----------------------------|--|
| 4 | Example of injury diagnoses variation <i>across</i> injury-related major code categories | | | |
| | 28-APR-2003 | 0 | 844.9 | Sprain of Unspecified Site of Knee and Leg Knee, not otherwise specified |
| | 29-APR-2003 | 1 | 719.46 | Pain In Joint Involving Lower Leg |
| | 07-MAY-2003 | 1 | 844.9 | Sprain of Unspecified Site of Knee and Leg Knee, not otherwise specified |
| 5 | Example of injury diagnoses variation <i>across</i> injury-related major code categories | | | |
| | 18-APR-2003 | 0 | 719.46 | Pain In Joint Involving Lower Leg |
| | 26-APR-2003 | 1 | 845.00 | Unspecified Site of Ankle Sprain |
| | 01-MAY-2003 | 1 | 719.47 | Pain In Joint Involving Ankle and Foot |
| | 05-MAY-2003 | 1 | 845.00 | Unspecified Site of Ankle Sprain |
| 6 | Example of diagnoses progression from pain to stress fracture | | | |
| | 07-JUL-2003 | 0 | 719.47 | Pain In Joint Involving Ankle And Foot |
| | 10-JUL-2003 | 1 | 719.47 | Pain In Joint Involving Ankle And Foot |
| | 11-JUL-2003 | 1 | 719.47 | Pain In Joint Involving Ankle And Foot |
| | 22-JUL-2003 | 1 | 733.10 | Pathologic Fracture, Unspecified Site Spontaneous Fracture |
| | 22-JUL-2003 | 1 | V57.1 | Other Physical Therapy |
| 7 | Example of diagnoses progression from pain to chondromalacia | | | |
| | 18-APR-2003 | 0 | 719.46 | Pain In Joint Involving Lower Leg |
| | 30-APR-2003 | 1 | 717.7 | Chondromalacia of Patella; Degeneration of cartilage of patella |
| | 30-APR-2003 | 1 | V57.1 | Other Physical Therapy |

d. Descriptive Analyses (Research Aim A).

The description of the study sample began with a comparison of demographics, physical fitness, and injury data on the study sample with trainees from the same basic training units who did not complete a RAP survey. To assess the generalizability of the sample, demographic data on the study sample were also compared to a larger sample of U.S. Army basic trainees and to the general U.S. 20-24 year old population.

Next, cumulative injury incidence, rates, injury types, and the frequency of multiple injuries in the study sample were tabulated. Total time-in-training was calculated for each trainee using the basic training unit start and end dates, or in the case of discharged persons or persons transferred to another unit, the unit's start date and the individual's discharge/transfer date. Injury rates and injury visit rates were calculated for males and females separately using gender-specific total time-in-training.

Health risk behavior data available from the RAP questionnaire were summarized by gender, with differences between genders assessed using chi-square tests of proportions. When chi-square tests showed statistically significant differences between genders for health risk behaviors with multiple levels (categories), selected chi-square tests were calculated to assist in identifying the specific levels with statistically significant differences, in accordance with the partition chi-square technique (Volicer 1981; Agresti 1990).

To investigate Question 1 of Research Aim A, a qualitative comparison of health risk behaviors in the study sample to nationally-representative samples of U.S. adolescents and young adults was conducted. To investigate Question 2 of Research Aim A, the following analyses were conducted by gender: bivariate analyses of risk-taking by social, psychological, and physical characteristics, distributions of risk categories (low/medium/high) within risk indices, proportion of trainees with high-risk indices scores by level of combined risk-taking, and correlations between risk indices.

e. Regression Analyses (Research Aim B).

(1) Univariate Cox Regression Analyses.

To assess the unadjusted associations of the combined risk-taking index, individual health risk behavior indices, and social and physiologic covariates with injury during basic training, univariate Cox regression was used, a methodology consistent with other recent Army injury investigations (Knapik, Hauret et al. 2001; Knapik, Bullock et al. 2004; Knapik, Darakjy et al. 2005). Time-to-first-injury was calculated for each trainee for each injury type using their basic training unit's start date and the appropriate first injury (any, overuse, traumatic, or with limitations) visit date. Trainees who were never injured were censored at the end of their basic training cycle (63-65 days), upon transfer from the unit, or upon discharge from the Army. Differences in time to first injury by gender were assessed using Kaplan-Meier cumulative hazard plots and log-rank tests generated in SPSS.

Given that prior research has consistently shown injury risk and risk factors vary by gender, all analyses were conducted separately for males and females. Health risk behavior indices were tested both as continuous and categorical (low/medium/high) variables. The combined risk-taking index was analyzed as a continuous variable and a categorical variable, with categories based on gender-specific standard deviations of combined risk-taking. Unadjusted hazard ratios and associated 95 % confidence intervals were calculated. For categorical variables, the level at lowest risk of injury was used as the referent category.

All regression analyses were conducted using Intercooled STATA™ 7.0 for Windows 98/95/NT (STATA™ is a trademark of the STATA Corporation). Since injury rates varied by battalion in this population due to unmeasured characteristics such as the commanders' physical training philosophy and attention to injury prevention, all regression models were adjusted for clustering by battalion and robust estimates of variance were produced using the CLUSTER command available in STATA.

(2) Multivariate Cox Regression Analyses.

Multivariate Cox regression was used to test the association of the combined risk-taking index with training-related injury, adjusting for social and physiologic factors. As with the univariate analyses, males and females were modeled separately and robust estimates of variance were obtained using the STATA CLUSTER command. When multiple forms of a variable had been tested in univariate analyses (such as, run time and run time quartiles), the continuous variable or the variable revealing an association with injury in the univariate analysis was selected for inclusion in the multivariate analyses. Results of both backward and forward stepwise regression models were reviewed. Potential variable interactions were determined a priori and tested prior to defining the final model. The cut point for removal and entry into the models was set at $p \leq 0.05$, although variables exiting the model at $p < 0.10$ are noted in the text.

The final adjusted multivariate models testing the association of the combined risk-taking index with any training-related injury were constructed using the following steps: (1) univariate (unadjusted) Cox regression with the combined risk index only; (2) multivariate Cox regression with the combined risk-taking index, adjusting for social variables of interest; (3) multivariate Cox regression with the combined risk-taking index, adjusting for social and physiologic variables of interest; (4) multivariate Cox regression with the combined risk-taking index, adjusting for social and physiologic variables that were significantly associated with injury in previous models and each of the five individual health risk indices, separately (such as, five separate models, each one evaluating additional risk explained by cigarette use, smokeless tobacco use, alcohol use, diet/lifestyle choices, and weight control practices); (5) multivariate Cox regression with the combined risk-taking index, adjusting for those factors demonstrating independent association with risk of injury in previous analyses. Other health risk behavior variables (age at first sexual intercourse, condom use, and number of moving violations) that had not been previously excluded and were not included in an index were also tested in Step 4. The final models (one for males, one for females) contained variables demonstrating sustained statistical significance (95 % confidence interval not containing 1.00) when all levels of the variables were included in a Cox regression analysis. When an interaction term remained statistically significant, the contributing variables plus the interaction term were retained in the

final model. Adjusted hazard ratios (HR) and 95% confidence intervals are reported. Final multivariate models based on any training-related injury were used to examine the association of the combined risk-taking index with other outcomes of interest: overuse training-related injury, traumatic training-related injury, and training-related injuries resulting in work limitations.

7. RESULTS–Part I: UNDERSTANDING HEALTH RISK BEHAVIORS AMONG ARMY BASIC TRAINEES (RESEARCH AIM A)

a. Comparison of RAP Participants vs. Non-Participants.

In this sample of 3,561 basic trainees, 1,919 (54 %) completed a RAP survey. When compared to non-participants (Table 7), a greater proportion of the RAP survey participants were white, older, married, a higher enlisted pay grade, and in the Regular Army. The proportion of males and females among participants and non-participants was comparable. The RAP participant population had greater representation from the educational extremes; a higher proportion of persons who had not graduated from HS and a higher proportion of persons with some college education or more participated in the RAP survey, as compared to non-participants.

Table 8 shows that both BMI and aerobic fitness upon entry to basic training (run time on initial APFT) did not differ between those who completed the RAP survey and those who did not ($p>0.100$). Statistically significant differences between certain measures of muscle endurance were observed, but absolute differences in the number of sit-ups and pushups completed were small.

Of the 1,919 trainees in this sample who completed a RAP survey, medical surveillance data were obtained for 1,902 (99.1 %). Table 9 shows that the proportion of trainees with one or more injury or illness visits did not differ between the two groups ($p=0.799$ and $p=0.354$, respectively).

Table 7. Comparison of Demographics, RAP Participants and Non-Participants

| Demographic variable | Specific category | Total sample (%) | Number of participants (%) | Number of non-participants (%) | p* |
|----------------------|------------------------------|------------------|----------------------------|--------------------------------|-------|
| Gender | Male | 2185 (61) | 1162 (61) | 1023 (62) | 0.285 |
| | Female | 1376 (39) | 757 (39) | 619 (38) | |
| Race/Ethnicity | White | 2059 (58) | 1188 (62) | 871 (53) | 0.000 |
| | Black | 729 (21) | 347 (18) | 382 (23) | |
| | Hispanic | 489 (14) | 243 (13) | 246 (15) | |
| | Other | 280 (8) | 141 (7) | 139 (9) | |
| Age group | 17-20 | 2368 (67) | 1201 (63) | 1167 (71) | 0.000 |
| | 21-37 | 1193 (34) | 718 (37) | 475 (29) | |
| Education | No HS diploma or still in HS | 477 (14) | 284 (15) | 193 (12) | 0.000 |
| | HS graduate | 2290 (66) | 1175 (61) | 1115 (71) | |
| | GED | 356 (10) | 226 (12) | 130 (8) | |
| | Some college | 200 (6) | 117 (6) | 83 (5) | |
| | Bachelor's or more | 162 (5) | 112 (6) | 50 (3) | |
| Marital status | Single | 2913 (82) | 1582 (83) | 1331 (87) | 0.003 |
| | Married | 450 (13) | 280 (15) | 170 (11) | |
| | Other | 75 (2) | 47 (2) | 28 (2) | |
| Pay grade | Enlisted-1 | 1916 (54) | 1020 (53) | 897 (55) | 0.002 |
| | Enlisted-2 | 728 (20) | 380 (20) | 348 (21) | |
| | Enlisted-3 | 747 (21) | 342 (21) | 342 (21) | |
| | Enlisted-4 | 168 (5) | 114 (6) | 54 (3) | |
| Component | Regular Army | 1933 (54) | 1104 (58) | 830 (51) | 0.000 |
| | Reserve | 774 (22) | 374 (19) | 400 (24) | |
| | National Guard | 851 (24) | 441 (23) | 410 (25) | |

Abbreviations: HS=high school, GED=General Educational Development

*from X^2 statistic

Table 8. Comparison of Physical Fitness Measures, RAP Participants and Non-Participants

| Characteristic | Gender | Participants Mean (\pm SD) | Non-participants Mean (\pm SD) | p* |
|-----------------------------|--------|----------------------------------|--------------------------------------|-------|
| BMI | Male | 24.7 (\pm 3.8) | 24.5 (\pm 3.7) | 0.171 |
| | Female | 23.1 (\pm 2.8) | 23.2 (\pm 2.8) | 0.601 |
| Run time on initial APFT | Male | 8.1 (\pm 1.3) | 8.0 (\pm 1.3) | 0.135 |
| | Female | 10.3 (\pm 2.0) | 10.2 (\pm 1.6) | 0.452 |
| Situps on initial APFT | Male | 31.5 (\pm 6.9) | 32.5 (\pm 6.9) | 0.001 |
| | Female | 24.7 (\pm 8.0) | 25.7 (\pm 8.6) | 0.032 |
| Pushups on initial APFT | Male | 28.0 (\pm 11.4) | 30.0 (\pm 11.4) | 0.000 |
| | Female | 9.3 (\pm 8.3) | 10.0 (\pm 9.0) | 0.099 |

APFT=Army Physical Fitness Test

SD=standard deviation

*from t-test

Table 9. Comparison of Medical Encounters, RAP Participants and Non-Participants

| Variable | Number of trainees (% of total sample) | Number of RAP participants (%) | Number of RAP non-participants (%) | p* |
|--|---|-----------------------------------|---------------------------------------|-------|
| Cumulative proportion of (one or more) injury visits | 1,317 (37.3) | 706 (37.1) | 611 (37.6) | 0.779 |
| Cumulative proportion of (one or more) illness visits | 1,913 (54.2) | 1,045 (54.9) | 868 (53.4) | 0.354 |
| Cumulative proportion of (one or more) environmental exposure-related visits | 83 (2.4) | 44 (2.3) | 39 (2.4) | 0.868 |

Number of trainees with medical information: 99.1% (3,528) of total sample; 99.0% (1,626) of non-participants; 99.1% (1,902) of participants.

*from χ^2 statistic

b. Comparison of Study Sample (RAP Participants) with Other Populations.

Table 10 shows the distribution of other demographic features of the RAP participant population compared to (1) a historical sample of U.S. Army basic trainees and (2) the U. S. 20-24 year old general population. The age, gender, and marital status distributions of this study sample were similar to previous Army basic training populations that have been the subject of injury investigations conducted by the USACHPPM (Knapik, Sharp et al. 1999; Canham-Chervak, Knapik et al. 2000; Knapik, Hauret et al. 2001). However, the sample used in this study contained fewer blacks and more persons who completed basic training prior to HS graduation. Compared to the 2002 U.S. population aged 20-24, this sample had a greater percentage of males, blacks, and single individuals and fewer persons who had a college education or higher.

Table 10. Comparison of Demographics of the Study Sample, a Larger Sample of U.S. Army Basic Trainees, and the 20-24 Year Old U.S. Population

| | Study sample (RAP participants with medical data), n=1,902 | U.S. Army basic trainees who trained at Fort Jackson (U.S. Army Center for Health Promotion and Preventive Medicine 2001), n=4,274 | U.S. population, 20-24 years of age, 2002 (U.S. Census Bureau 2002), n=20,214,000 |
|----------------------------------|---|--|---|
| Age (mean±SD) | 20.8±3.9 | 20.7±3.7 | -- |
| Gender (%) | | | |
| Male | 60.8 | 57.2 | 50.9 |
| Female | 39.2 | 42.8 | 49.1 |
| Race (%) | | | |
| Black | 17.9 | 31.1 | 14.5 |
| White | 62.3 | 52.9 | 78.0 |
| Other | 19.9 ¹ | 16.0 | 7.5 |
| Ethnicity (%) | | | |
| Hispanic | 12.5 | n/a | 17.8 |
| Marital status (%) | | | |
| Single | 82.8 | 81.0 | 79.7 |
| Married | 14.7 | 19.0 | 19.1 |
| Divorced | n/a | n/a | 1.0 |
| Widowed | n/a | n/a | <1.0 |
| Other | 2.5 ² | n/a | n/a |
| Educational level (%) | | | |
| Did not complete HS ³ | 14.7 | 0.0 | 13.1 ⁴ |
| GED certificate | 11.9 | 14.2 | n/a |
| HS graduate | 61.6 | 65.6 | 28.4 |
| Some college | 6.1 | 14.2 | 19.1 |
| College graduate | 5.7 | 6.1 | 31.9 |
| Advanced degree | n/a | n/a | 7.4 |

¹ includes 12.5% reporting Hispanic ethnicity² includes divorced, separated, and widowed³ This category includes trainees who enlisted, but are still in HS and chose to complete basic training prior to HS graduation. Also includes trainees for whom the requirement for a HS diploma was waived.⁴ Data on educational attainment are for 25-34 year olds (n=38,670)

Abbreviation: n/a=data not available

c. Descriptive Analyses of the Study Sample.

(1) Study Sample by Unit.

The distribution of units included in the study sample is shown in Table 11. All units conducted basic training in the spring or early summer of 2003. Gender distribution differed for Battalion 2, Cycle 2 compared to the other units ($p < 0.001$).

Table 11. Distribution of Sample by Basic Training Unit and Gender

| Basic training unit and cycle (n=total trainees) | Training start date range ¹ | Males in unit Frequency (% of battalion) | Females in unit Frequency (% of battalion) |
|---|--|--|--|
| Battalion 1, Cycle 1 (n=673) | 21-28MAR03 | 397 (59.0) | 276 (41.0) |
| Battalion 2, Cycle 1 (n=556) | 16-18APR03 | 317 (57.0) | 239 (43.0) |
| Battalion 2, Cycle 2 (n=673) | 25-27JUN03 | 442 (65.7) | 231 (34.3) |

¹ Start date varied by individual company within each battalion.

Total sample=1,902 (1,156 males, 746 females)

Table 12 shows cumulative training-related injury incidence (such as, trainees with one or more injuries in the basic training cycle) by unit and gender. Statistically significant differences between cumulative injury incidence by unit were seen for both males and females ($p=0.003$ and $p=0.038$, males and females respectively). Based on these data, a decision was made to control analyses for clustering effects by unit (STATA CLUSTER command). Additional descriptive data on injuries in this sample will be presented shortly.

Table 12. Cumulative Training-Related Injuries during the Basic Training Cycle, by Unit and Gender

| Basic training unit and cycle | Cumulative Training-Related Injuries | | |
|--|--|--|--|
| | Males number injured (% of males in the Battalion) | Females number injured (% of females in the Battalion) | Total number injured (% of total in the Battalion) |
| Battalion 1, Cycle 1 (n=397 males, 276 females) | 125 (31.5) | 163 (59.1) | 288 (42.8) |
| Battalion 2, Cycle 1 (n=317 males, 239 females) | 75 (23.7) | 135 (56.5) | 210 (37.8) |
| Battalion 2, Cycle 2 (n=442 males, 231 females) | 96 (21.7) | 111 (48.1) | 207 (30.8) |

Total sample=1,902 (1,156 males, 746 females)

(2) Attrition from Basic Training.

Trainees in these units could leave the unit prior to the end of the basic training cycle for two reasons: (1) discharge from the Army, or (2) reassignment to another unit. There were a total of 147 discharges and 45 reassignments. Proportions by gender are presented in Table 13. Leading reasons for discharge included failure to adapt to military life and related mental conditions (47.0 %), and medical disorders, such as chronic musculoskeletal disorders, that existed prior to service and were exacerbated by training (41.5 %). Reassignment to another unit occurred primarily due to “motivational” difficulties (64.4 %) and missed training (31.1 %).

Table 13. Attrition from Basic Training by Gender

| | Males Frequency (% males) | Females Frequency (% females) | Total Frequency (% total) |
|----------------------------|---------------------------------|-------------------------------------|---------------------------------|
| Discharged from Army | 60 (5.2) | 87 (11.7) | 147 (7.7) |
| Reassigned to another unit | 25 (2.2) | 20 (2.7) | 45 (2.4) |
| Totals | 85 (7.4) | 107 (14.3) | 192 (10.1) |

Total sample=1,902 (1,156 males, 746 females)

(3) Medical Surveillance Data on Injuries.

Table 14 demonstrates the importance of injury in relation to other medical conditions. Primary diagnoses, or the main causes of medical visits as determined by a provider, are listed by gender and major ICD-9-CM code category. Looking specifically at injuries, 24.8 % of male visits and 33.7 % of female visits received injury-related ICD-9-CM primary diagnosis codes. Of the visits (initial and follow-up) made by females during their basic training cycles, the leading primary diagnoses were musculoskeletal conditions (25.1 %), followed by respiratory conditions (20.0 %) and V-codes (18.6 %). Among male basic trainees, the majority of visits received a primary diagnosis of respiratory (30.8 %), followed by musculoskeletal (17.2 %), and V-codes (13.8 %).

Table 14. Distribution of Primary Diagnoses Codes for Medical Visits during Army Basic Training by Gender (n=1156 males, 746 females)

| Disease or injury category | Associated ICD-9-CM codes | Males number of visits (%) | Females number of visits (%) | Total number of visits (%) |
|-------------------------------------|---------------------------|----------------------------|------------------------------|----------------------------|
| Injury-related | | | | |
| Musculoskeletal | 710-739 | 357 (17.2) | 696 (25.1) | 1053 (21.7) |
| Injury & poisonings | 800-999 | 158 (7.6) | 239 (8.6) | 397 (8.2) |
| Respiratory system | 460-519 | 640 (30.8) | 555 (20.0) | 1195 (24.6) |
| V-code | V01-V85 | 288 (13.8) | 515 (18.6) | 803 (16.6) |
| Symptoms, signs, and ill-defined | 780-799 | 144 (6.9) | 212 (7.7) | 356 (7.3) |
| Infectious & parasitic | 001-139 | 138 (6.6) | 134 (4.8) | 272 (5.6) |
| Skin & subcutaneous tissue | 680-709 | 131 (6.3) | 60 (2.2) | 191 (3.9) |
| Mental disorders | 290-319 | 63 (3.0) | 105 (3.8) | 168 (3.5) |
| Nervous system & sensory organs | 320-389 | 92 (4.4) | 63 (2.3) | 155 (3.2) |
| Digestive system | 520-579 | 40 (1.9) | 81 (2.9) | 121 (2.5) |
| Genitourinary system | 580-629 | 9 (0.4) | 78 (2.8) | 87 (1.8) |
| Endocrine, nutritional, & metabolic | 240-279 | 8 (0.4) | 14 (0.5) | 22 (0.5) |
| Circulatory system | 390-459 | 11 (0.5) | 6 (0.2) | 17 (0.4) |
| Blood & blood organs | 280-289 | 0 (0.0) | 9 (0.3) | 9 (0.2) |
| Pregnancy | 630-677 | 0 (0.0) | 3 (0.1) | 3 (0.1) |
| Congenital anomalies | 740-759 | 1 (0.0) | 0 (0.0) | 1 (0.0) |
| Neoplasms | 140-239 | 0 (0.0) | 1 (0.0) | 1 (0.0) |
| Perinatal period | 760-779 | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| E-codes | E800-E999 | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Total | | 2,080 (100) | 2,771 (100) | 4,851 (100) |

Secondary diagnoses were recorded for only 577 (27.7 %) of male visits and 898 (32.4 %) of female visits (data not shown). Leading categories of secondary diagnoses for male trainees included musculoskeletal (30.8 %), respiratory (16.8 %), and V-codes. Leading categories for female trainees included musculoskeletal (38.8 %), V-codes (13.8 %), and injury (11.4 %).

(4) Injuries.

Table 15 shows the cumulative training-related injury rates (that is, trainees with one or more injuries during training) per 1,000 trainee-days by gender. Stated differently, these rates suggest that, among a group of 100 females, 60 females would be injured one or more times over the course of a typical basic training cycle (65 days). Among a group of 100 males, it would be expected that 27 would be injured one or more times over the course of a typical basic training cycle.

Table 15. Cumulative Injury Incidence[†] (Injured Trainees/1,000 Trainee-Days) during Basic Training by Gender and Injury Type

| | Training-related injury [‡] | Overuse training-related injury [‡] | Traumatic training-related injury [‡] | Training-related injury with limitations [‡] |
|---------|--------------------------------------|--|--|---|
| Males | 4.2 | 2.9 | 1.5 | 3.9 |
| Females | 9.3 | 7.2 | 3.8 | 8.8 |
| Total | 6.1 | 4.5 | 2.4 | 5.7 |

n=1,156 males, 746 females

[†] Defined as “Trainees who experienced one or more injuries during basic training.”

It was possible for a trainee to be counted in each injury subcategory (overuse, traumatic, and injury with limitations).

[‡] Statistically significant difference existed between male and female proportions (p<0.001).

While the injury rates were high, the number of multiple injuries was minimal (Table 16). Among injured males, 79.4 % had only one injury during training and 70.3 % of injured females had only one injury during training.

Table 16. Frequency of Unique (Incident) Injuries among Injured Trainees by Gender and Injury Type

| Number of unique (incident) injuries | Training-related injury ¹ Frequency (% within gender) | Overuse training-related injury ² Frequency (% within gender) | Traumatic training-related injury Frequency (% within gender) | Training-related injury with limitations ² Frequency (% within gender) |
|--------------------------------------|---|---|--|--|
| Males | | | | |
| 1 | 235 (79.4) | 16 (87.3) | 91 (92.9) | 222 (81.0) |
| 2 | 50 (16.9) | 22 (11.6) | 6 (6.1) | 46 (16.8) |
| 3 | 7 (2.4) | 1 (0.5) | 1 (1.0) | 5 (1.8) |
| 4 | 4 (1.4) | 1 (0.5) | 0 (0) | 1 (0.4) |
| Females | | | | |
| 1 | 286 (70.3) | 225 (79.5) | 124 (87.9) | 287 (74.2) |
| 2 | 90 (22.1) | 52 (18.4) | 16 (11.3) | 76 (19.6) |
| 3 | 28 (6.9) | 6 (2.1) | 1 (0.7) | 22 (5.7) |
| 4 | 3 (0.7) | 0 (0) | 0 (0) | 2 (0.5) |

n=296 males, 409 females with any training-related injury; 189 males, 283 females with overuse injury; 98 males, 141 females with traumatic injury; 274 males, 387 females with injury resulting in limitation.

¹ p<0.05

² p<0.10

Looking at specific diagnoses for all visits (incident and follow-up), the leading training-related injury diagnoses for both males and females were ‘Pain in joint, lower leg’ (18.0 % and 11.6 %, males and females respectively), ‘Pain in joint, ankle or foot’ (6.5 and 11.5%), and ‘Other

physical therapy' (16.8% and 17.8%). Of the unique (incident) training-related injuries among female trainees, the majority (69.2%) were coded as musculoskeletal in nature (ICD-9-CM 710-739), followed by 29.2% acute injuries (ICD-9-CM 800-999), and 1.9% coded in the Skin and Subcutaneous Tissue Category (ICD-9-CM 680-709). Among males, the unique (incident) visits for training-related injuries were in the following disease and injury code categories: musculoskeletal (65.4%), injury (28.2%), and skin and subcutaneous tissue (6.4%).

Figure 3 shows the distribution of training-related injuries over time. Especially among females, training-related injuries tended to occur at the beginning of the training cycle.

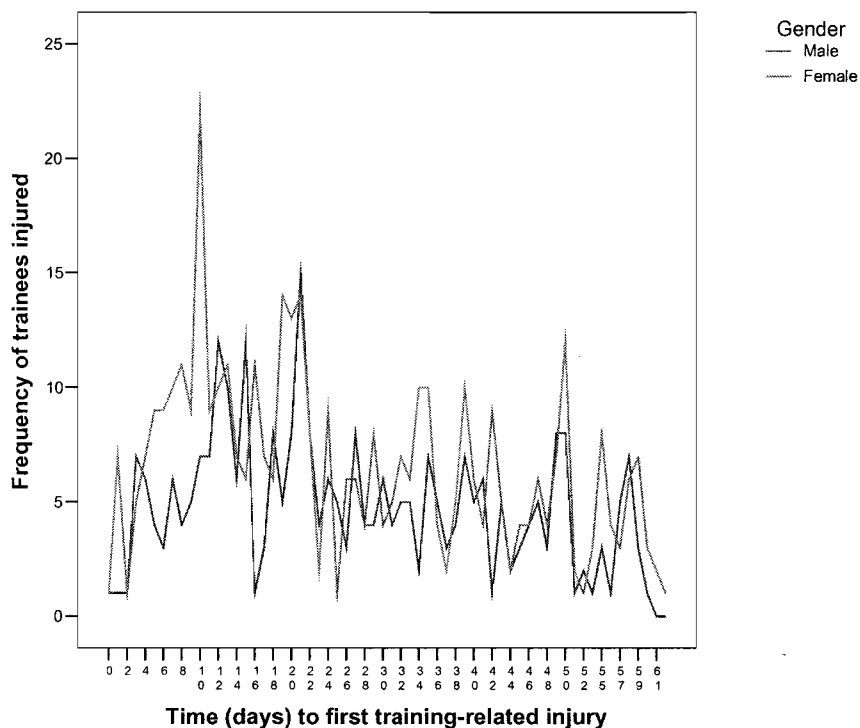


Figure 3. Time to First Training-Related Injury
(Excluding Uninjured Trainees)

(5) Health Risk Behavior and Other Data from the RAP Questionnaire.

Tables 17-23 present descriptive information on the study sample, summarized for the total population and by gender. Data are from the RAP questionnaire unless otherwise noted. Sixty-three percent of this sample was between the ages of 17 and 20 years old (Table 17). The majority were white (62.3%), single (82.8%), and had a HS education (61.6%). The proportion of black females (25.5%) was significantly greater than the proportion of black males (13.1%) ($p < 0.001$). Most parents of trainees in this sample had a HS diploma or higher degree (84.2% and 88.4%, fathers and mothers, respectively). Most trainees were born in the U.S. (90.9%) and over a third were from Southern states (37.5%). Nearly a third (30.5%) were from a small town or rural area, but most (53.5%) were from a large or small city. Over a quarter of the sample came from a one-parent family and 41% came from homes with four or more children.

Table 17. Demographics of Sample Population for Study Sample by Gender¹

| Demographic characteristics from RAP survey | % Total (n=total non-missing) | % Males (n=total non-missing) | % Females (n=total non-missing) | χ^2 p-value |
|---|----------------------------------|----------------------------------|------------------------------------|------------------|
| Age group ² | n=1902 | n=1156 | n=746 | 0.375 |
| 17-20 | 62.6 | 63.4 | 61.4 | |
| 21-37 | 37.4 | 36.6 | 38.6 | |
| Race/ethnicity ² | n=1902 | n=1156 | n=746 | 0.000 |
| White, non-Hispanic | 62.3 | 67.4 | 54.3 | |
| Black, non-Hispanic | 17.9 | 13.1 | 25.5 | |
| Hispanic | 12.5 | 11.8 | 13.5 | |
| Other | 7.4 | 7.8 | 6.7 | |
| Marital status ³ | n=1892 | n=1149 | n=743 | 0.041 |
| Single | 82.8 | 84.2 | 80.6 | |
| Married, widowed, or divorced | 17.2 | 15.8 | 19.4 | |
| Educational level ² | n=1897 | n=1154 | n=743 | 0.001 |
| Still in HS (split option) or no HS diploma | 14.8 | 16.7 | 11.7 | |
| HS | 61.6 | 58.8 | 65.8 | |
| GED | 11.9 | 13.2 | 9.8 | |
| Some college or 4 years college or more | 11.8 | 11.3 | 12.7 | |
| Father's highest education | n=1492 | n=919 | n=573 | 0.711 |
| No HS diploma | 15.8 | 16.0 | 15.4 | |
| HS or GED | 33.3 | 33.4 | 33.2 | |
| Some college/tech school | 27.2 | 26.2 | 28.8 | |
| 4 years college or more | 23.7 | 24.4 | 22.7 | |
| Mother's highest education | n=1679 | n=1008 | n=671 | 0.059 |
| No HS diploma | 11.6 | 10.4 | 13.4 | |
| HS GED | 34.9 | 35.9 | 33.4 | |
| Some college | 30.9 | 29.5 | 33.1 | |
| 4 or more years of college | 22.6 | 24.2 | 20.1 | |
| Country of birth | n=1888 | n=1146 | n=742 | 0.471 |
| U.S. or U.S. territory | 90.9 | 90.0 | 91.0 | |
| Caribbean | 2.1 | 1.8 | 2.6 | |
| Europe | 1.5 | 1.5 | 1.5 | |
| North America | 1.2 | 1.1 | 1.4 | |
| Central/South America | 1.3 | 1.0 | 1.6 | |
| Asia | 1.3 | 1.7 | 0.7 | |
| Other (groups contributing <1%) | 1.6 | 1.9 | 1.2 | |
| Region of origin (U.S.) | n=1682 | n=1023 | n=659 | 0.093 |
| South | 37.5 | 35.3 | 40.8 | |
| West | 21.7 | 21.3 | 22.3 | |
| Midwest | 20.8 | 22.4 | 18.4 | |
| Northeast | 18.4 | 19.4 | 16.8 | |
| Other (Puerto Rico, Guam) | 1.7 | 1.7 | 1.7 | |

¹ n=1,902 (1,156 males, 746 females)² Obtained primarily from program evaluation data. When data were missing, responses were completed with information from other data sources.³ Obtained primarily from medical surveillance/personnel data. When data were missing, responses were completed with information from other data sources.

Table 17. Demographics of Sample Population for Study Sample by Gender¹ (continued)

| Demographic characteristics from RAP survey | % Total (n=total non-missing) | % Males (n=total non-missing) | % Females (n=total non-missing) | χ^2 p-value |
|---|----------------------------------|----------------------------------|------------------------------------|------------------|
| Where lived most of time as child | n=1872 | n=1133 | n=739 | 0.071 |
| Large city or suburb ² | 28.2 | 28.3 | 28.0 | |
| Small city | 25.3 | 27.4 | 22.2 | |
| Small town | 19.0 | 18.5 | 19.6 | |
| Moved around a lot | 14.6 | 14.0 | 15.4 | |
| Farm, ranch, or rural area | 11.6 | 10.8 | 12.9 | |
| Not sure | 1.3 | 1.0 | 1.9 | |
| Raised by | n=1878 | n=1140 | n=738 | 0.204 |
| Two parents | 57.9 | 60.4 | 54.2 | |
| One parent | 26.3 | 24.9 | 28.3 | |
| Grandparents | 2.2 | 2.0 | 2.6 | |
| Foster parent or guardian | 1.0 | 0.8 | 1.2 | |
| Other relative | 0.6 | 0.5 | 0.8 | |
| Group home or institution | 0.3 | 0.2 | 0.4 | |
| Other | 1.1 | 1.2 | 0.8 | |
| Multiple responses | 10.6 | 10.0 | 11.7 | |
| Adopted | n=1873 | n=1138 | n=735 | 0.606 |
| | 4.3 | 4.1 | 4.6 | |
| Number of siblings in same home | n=1853 | n=1123 | n=730 | 0.161 |
| 0 | 7.9 | 8.7 | 6.6 | |
| 1 | 26.4 | 26.5 | 26.2 | |
| 2 | 24.6 | 25.2 | 23.6 | |
| 3 | 17.4 | 17.5 | 17.1 | |
| 4 | 9.1 | 8.0 | 10.8 | |
| 5 or more | 14.7 | 14.0 | 15.8 | |

¹ n=1,902 (1,156 males, 746 females)² A large city or suburb was defined as >100,000 residents; a small city=10,000-100,000 residents; a small town as <10,000 residents.

Table 18 shows that over half (53.1%) of the sample entered the Army at the lowest enlisted pay grade and had enlisted in the Regular Army (57.4%) as opposed to the National Guard or Reserves. A small proportion had prior military service (4.3%) and over a third (38.2%) had a parent who had served in the military. The leading reason for joining the Army was to gain an education and job skills (74.0%).

Table 18. Military Service-Related Information for Study Sample by Gender¹

| Information related to military service | % Total (n=total non- missing) | % Males (n=total non- missing) | % Females (n=total non- missing) | χ^2 p-value |
|---|---|---|---|---------------------|
| Rank/Pay grade | n=1902 | n=1156 | n=746 | 0.049 |
| E1 | 53.1 | 54.8 | 50.5 | |
| E2 | 19.8 | 20.0 | 19.4 | |
| E3 | 21.3 | 19.2 | 24.5 | |
| E4 | 5.8 | 6.1 | 5.5 | |
| Component | n=1902 | n=1156 | n=746 | 0.001 |
| Regular Army | 57.4 | 54.2 | 62.2 | |
| Army Reserves or National Guard | 42.6 | 45.8 | 37.8 | |
| Prior military service | n=1890 | n=1149 | n=741 | 0.860 |
| | 4.3 | 4.4 | 4.2 | |
| Father or mother served in military | n=1902 | n=1156 | n=746 | 0.866 |
| | 38.2 | 38.3 | 37.9 | |
| Reason joined Army ² | n=1902 | n=1156 | n=746 | 0.007 |
| Education and new job skills | 74.0 | 71.2 | 78.4 | |
| Travel and adventure | 4.8 | 4.8 | 5.0 | |
| Earn money | 4.0 | 5.1 | 2.4 | |
| Leave problems at home | 0.8 | 0.7 | 0.9 | |
| Family member in military | 1.2 | 1.3 | 1.1 | |
| Want 20 year career | 2.5 | 2.7 | 2.1 | |
| Serve my country | 6.2 | 7.2 | 4.6 | |
| Other reasons | 6.5 | 7.1 | 5.5 | |

¹ n=1,902 (1,156 males, 746 females)

² Multiple responses allowed

Table 19 indicates that males, on average, were taller, heavier, and had a higher BMI compared to females ($p<0.001$). The average BMI for both males and females were within the “healthy” weight range for adults (BMI=18.5 to 25.0) (Centers for Disease Control and Prevention 2005). Males had faster run times, with an average of 8.12 minutes/mile compared to 10.20 minutes/mile for females ($p<0.001$). Males also performed more push-ups (28 vs. 9 push-ups in 2 minutes, males vs. females respectively) and sit-ups (32 vs. 25 sit-ups in 2 minutes, males vs. females respectively) on the initial APFT ($p<0.001$). The same was true for the final APFT test ($p<0.001$).

Table 19. Physiologic Characteristics and Physical Fitness for Study Sample by Gender¹

| Physiologic and physical fitness measures obtained during BCT | Mean(\pm SD) Males | Mean(\pm SD) Females | t-test p-value |
|---|------------------------------|-----------------------------|-------------------|
| Height (inches) | n=1156 69.3 (\pm 2.8) | n=746 64.4(\pm 2.6) | 0.000 |
| Weight (pounds) | n=1156 169.2(\pm 29.2) | n=746 136.5(\pm 20.7) | 0.000 |
| Body mass index (weight/height ²) | n=1156 24.7(\pm 3.8) | n=746 23.1(\pm 2.8) | 0.000 |
| Initial APFT ² 1-mile run time (minutes) | n=1115 8.12(\pm 1.30) | n=717 10.20(\pm 1.57) | 0.000 |
| Initial APFT sit-ups completed in 2 minutes | n=1121 31.5(\pm 6.9) | n=722 24.7(\pm 9.0) | 0.000 |
| Initial APFT push-ups completed in 2 minutes | n=1121 28.0(\pm 11.4) | n=721 9.2(\pm 8.3) | 0.000 |
| Final APFT ² 2-mile run time (minutes) | n=1050 14.77(\pm 1.37) | n=605 17.99(\pm 1.83) | 0.000 |
| Final APFT sit-ups completed in 2 minutes | n=1051 62.9(\pm 10.6) | n=607 60.0(\pm 12.0) | 0.000 |
| Final APFT push-ups completed in 2 minutes | n=1051 47.4(\pm 12.0) | n=607 24.9(\pm 10.5) | 0.000 |

¹ n=1,902 (1,156 males, 746 females)

² The initial APFT for this sample consisted of a 1-mile run for time, sit-ups completed in 2 minutes, and push-ups completed in 2 minutes. The final APFT consisted of a 2-mile run for time, sit-ups completed in 2 minutes, and push-ups completed in 2 minutes.

Table 20 describes selected medical history items from the RAP questionnaire. A greater proportion of male trainees in this sample reported no visits to a health care provider in the past 5 years (17.6 vs. 9.1%, males and females, respectively). Some males (12.8%) and females (9.1%) had been treated for a work-related injury and lost work time due to the injury (8.9%). Among work-related exposures addressed in the RAP questionnaire, exposure to loud noise was reported by 64% of trainees, followed by exposures to dust (59.9%) and fumes (35.8%). One quarter (25.4%) of all trainees reported a history of muscle aches, 13.8% had experienced swollen or painful joints, and 11.4% reported knee trouble.

Table 21 shows that over half of trainees (63.7%) believed their health to be very good or excellent, with only 6.2% believing their health was fair or poor. A fifth (21.0%) reported that their health had improved over the past year and 67.7% reported pain had not interfered with normal work during the past year.

Table 20. Selected Medical History for Study Sample by Gender¹

| Medical history from RAP survey | % Total (n=total non-missing) | % Males (n=total non-missing) | % Females (n=total non-missing) | χ^2 p-value ³ |
|---|----------------------------------|----------------------------------|------------------------------------|----------------------------------|
| Medical care, last 5 years | n=1899 | n=1154 | n=745 | |
| General, family, or other medical doctor | 73.7 | 68.0 | 82.4 | 0.000 |
| Dentist | 54.3 | 53.3 | 55.8 | 0.277 |
| Optometrist | 31.3 | 27.8 | 36.6 | 0.000 |
| Surgeon | 7.9 | 7.6 | 8.3 | 0.583 |
| Alternative health practitioner | 5.2 | 3.7 | 7.4 | 0.000 |
| Mental health professional | 3.1 | 2.2 | 4.4 | 0.005 |
| Specialist or counselor in alcohol problems | 1.2 | 1.6 | 0.7 | 0.084 |
| None of above | 14.3 | 17.6 | 9.1 | 0.000 |
| Health problems due to previous job(s) | n=1844 2.9 | n=1116 2.8 | n=728 3.2 | 0.635 |
| Treated in medical clinic for work-related injury | n=1837 11.3 | n=1113 12.8 | n=724 9.1 | 0.016 |
| Lost one or more days of work due to injury | n=1824 8.9 | n=1101 9.4 | n=723 8.3 | 0.439 |
| Hospitalized due to work-related injury | n=1815 0.9 | n=1096 0.8 | n=719 1.1 | 0.525 |
| Ever exposed at work to: | n=1523-1756 ² | n=919-1066 ² | n=604-693 ² | |
| Loud noise | 64.0 | 68.2 | 57.4 | 0.000 |
| Dust | 59.9 | 65.4 | 51.6 | 0.000 |
| Fumes | 35.8 | 44.1 | 23.2 | 0.000 |
| Smoke from burning things | 23.2 | 27.8 | 16.0 | 0.000 |
| Welding material | 19.3 | 27.1 | 7.2 | 0.000 |
| Insecticides/herbicides | 12.5 | 14.7 | 9.4 | 0.001 |
| Lead | 8.1 | 10.6 | 4.5 | 0.000 |
| Asbestos | 5.6 | 7.4 | 3.0 | 0.000 |
| Ionizing radiation | 4.2 | 3.1 | 5.9 | 0.005 |
| History of (ever had): | n=1779-1809 ² | n=1080-1098 ² | n=699-711 ² | |
| Muscle aches | 25.9 | 23.0 | 30.4 | 0.000 |
| Dizziness/fainting/lightheadedness | 15.8 | 10.6 | 24.0 | 0.000 |
| Foot pain/corns/bunions | 14.7 | 13.4 | 16.7 | 0.049 |
| Swollen/stiff/painful joints | 13.8 | 13.9 | 13.7 | 0.921 |
| Shortness of breath | 11.5 | 9.9 | 14.0 | 0.008 |
| Knee trouble | 11.4 | 10.4 | 13.0 | 0.093 |
| Chest pain/pressure | 8.7 | 7.7 | 10.3 | 0.053 |
| Asthma | 4.0 | 4.1 | 3.9 | 0.854 |
| Scoliosis/curvature of spine | 3.2 | 2.6 | 4.3 | 0.051 |
| Arthritis/rheumatism/bursitis | 2.4 | 2.3 | 2.5 | 0.745 |

¹ n=1,902 (1,156 males, 746 females)² Range of valid responses for questions in group³ p-value for "yes" vs. "no" ("do not know" excluded)

Table 21. Selected Self-Assessed Health for Study Sample by Gender¹

| Self-assessed health from RAP survey | % Total (n=total non- missing) | % Males (n=total non- missing) | % Females (n=total non- missing) | χ^2 p-value |
|---|---|---|---|------------------|
| In general, health is: | n=1676 | n=1004 | n=672 | 0.262 |
| Excellent | 25.1 | 27.0 | 22.2 | |
| Very good | 38.6 | 37.7 | 39.9 | |
| Good | 30.1 | 29.1 | 31.7 | |
| Fair | 5.8 | 5.8 | 6.0 | |
| Poor | 0.4 | 0.4 | 0.3 | |
| In general, has your health changed in the past year? | n=1663 | n=999 | n=664 | 0.000 |
| Yes, worse | 6.4 | 6.7 | 6.0 | |
| Yes, better | 21.0 | 24.8 | 15.4 | |
| Pain interfered with normal work in the past year? | n=1645 | n=989 | n=656 | 0.764 |
| Not at all | 67.7 | 67.1 | 68.6 | |
| A little | 24.1 | 24.7 | 23.3 | |
| Moderately | 6.8 | 7.1 | 6.4 | |
| Quite a lot | 0.9 | 0.8 | 1.1 | |
| Extremely | 0.4 | 0.3 | 0.6 | |

¹ n=1,902 (1,156 males, 746 females)

Responses to RAP questions concerning emotional and mental health (Table 22) indicated that the majority of trainees in this sample (97.1%) had one or more persons whom they could go to for help with personal problems. Church or other religious gatherings were a regular source of support for some (31.3%). Parental divorce was experienced by 39.3% and, of all major life events in the past year, death of someone close was the most common (20.7%). Over a third (35.6%) reported being angry enough to hit, kick, or throw things once a month or more.

While many trainees reported feeling that they had someone to take care of them (82.5%) and someone who loved them (77.4%) while growing up, 20.5% reported emotional abuse, 7.6% reported physical abuse, and 5.5% reported abuse between adults in the home (percentages represent trainees reporting “often or very often”). More females than males reported sexual abuse (13.7 and 2.7%, females and males, respectively; $p<0.001$) and living with someone who was depressed or mentally ill (21.6 and 14.1%, females and males, respectively). A fifth (20.8%) of trainees reported they had lived with a problem drinker or alcoholic. Data collected on past traumatic experiences indicated that more males than females had ever been in an accident where they could have been killed, seen a stranger badly injured or killed, and been threatened with a knife, gun, or other weapon ($p<0.001$). Seven percent of trainees had been in an accident where they were injured and spent at least one night in the hospital, 20% had seen a close family member or friend badly injured or killed, and 13% had been seriously assaulted. More females (17.0%) than males (1.6%) reported having been raped ($p<0.001$).

Table 22. Selected Emotional and Mental Health Indicators for Study Sample by Gender¹

| Emotional and mental health indicators from RAP survey | % Total (n=total non-missing) | % Males (n=total non-missing) | % Females (n=total valid responses) | χ^2 p-value |
|---|----------------------------------|----------------------------------|--|---------------------|
| Number of close friends/relative to call for help re: personal problems | n=1801 | n=1089 | n=712 | 0.713 |
| 0 | 2.9 | 3.1 | 2.5 | |
| 1 | 6.7 | 7.1 | 6.0 | |
| 2 | 17.3 | 16.9 | 18.0 | |
| 3-4 | 31.2 | 30.5 | 32.3 | |
| 5 or more | 41.9 | 42.4 | 41.2 | |
| How often attended church, synagogue, or other religious gathering | n=1791 | n=1081 | n=710 | 0.001 |
| Almost never | 32.5 | 36.0 | 27.2 | |
| Once or twice a year | 18.6 | 16.7 | 21.4 | |
| Once a month | 17.6 | 16.0 | 20.1 | |
| Once a week | 22.9 | 22.8 | 23.0 | |
| More than once a week | 8.4 | 8.4 | 8.3 | |
| Experiences in past year ³ : | n=1902 | n=1156 | n=746 | |
| Married | 7.7 | 7.8 | 7.5 | 0.824 |
| Had child | 4.6 | 5.0 | 4.0 | 0.313 |
| Got divorced | 1.5 | 1.5 | 1.6 | 0.810 |
| Arrested by police | 3.8 | 4.9 | 2.1 | 0.002 |
| Fired from job | 7.5 | 8.2 | 6.4 | 0.150 |
| Death of someone close | 20.7 | 17.6 | 25.5 | 0.000 |
| Get mad enough to hit/kick/throw things | n=1752 | n=1053 | n=699 | 0.675 |
| Never | 36.6 | 36.3 | 37.1 | |
| About once a year | 27.9 | 27.7 | 28.2 | |
| About once a month | 21.6 | 21.1 | 22.3 | |
| About once a week | 8.7 | 9.4 | 7.6 | |
| More than once/week | 5.3 | 5.5 | 4.9 | |
| Parents divorced | n=1795 | n=1084 | n=711 | 0.001 |
| No | 47.7 | 50.6 | 43.5 | |
| Yes | 39.3 | 39.0 | 39.5 | |
| Don't know | 1.2 | 1.0 | 1.5 | |
| Never married | 11.8 | 9.4 | 15.5 | |
| When growing up, you felt there was someone to take care of and protect you | n=1736 | n=1044 | n=692 | 0.104 |
| Never true | 2.1 | 2.3 | 1.9 | |
| Rarely true | 4.5 | 4.1 | 5.1 | |
| Sometimes true | 10.9 | 10.6 | 11.3 | |
| Often true | 20.6 | 22.6 | 17.5 | |
| Very often true | 61.9 | 60.3 | 64.3 | |
| When growing up, you felt loved | n=1730 | n=1039 | n=691 | 0.142 |
| Never true | 1.7 | 1.8 | 1.6 | |
| Rarely true | 6.5 | 6.4 | 6.8 | |
| Sometimes true | 14.3 | 12.7 | 16.8 | |
| Often true | 21.0 | 22.1 | 19.2 | |
| Very often true | 56.4 | 57.0 | 55.6 | |

¹ n=1,902 (1,156 males, 746 females)

Table 22. Emotional and Mental Health Indicators for Study Sample by Gender¹ (continued)

| Emotional and mental health indicators from RAP survey | % Total (n=total non-missing) | % Males (n=total non-missing) | % Females (n=total valid responses) | χ^2 p-value |
|---|----------------------------------|----------------------------------|--|------------------|
| Adverse Childhood Experiences Survey Questions (Felitti, Anda et al. 1998) | | | | |
| Parent/adult in home swore at you, insulted you, or put you down | n=1732 | n=1041 | n=691 | 0.117 |
| Never | 27.2 | 26.1 | 28.8 | |
| Once/twice | 27.7 | 28.5 | 26.5 | |
| Sometimes | 24.5 | 26.2 | 22.0 | |
| Often | 11.4 | 10.7 | 12.6 | |
| Very often | 9.1 | 8.5 | 10.1 | |
| Parent/adult in home pushed, grabbed, or slapped you? | n=1751 | n=1060 | n=691 | 0.139 |
| Never | 47.8 | 48.5 | 46.7 | |
| Once/twice | 27.6 | 28.6 | 26.2 | |
| Sometimes | 17.0 | 16.6 | 17.7 | |
| Often | 4.5 | 3.9 | 5.4 | |
| Very often | 3.1 | 2.5 | 4.1 | |
| Parents/adults in home pushed, grabbed, or slapped each other? | n=1747 | n=1055 | n=692 | 0.032 |
| Never | 67.1 | 68.6 | 64.7 | |
| Once/twice | 17.6 | 17.4 | 17.8 | |
| Sometimes | 9.8 | 9.8 | 10.0 | |
| Often | 3.8 | 3.1 | 4.9 | |
| Very often | 1.7 | 1.0 | 2.6 | |
| Adult touched you sexually or tried to make you touch them | n=1732 | n=1057 | n=675 | 0.000 |
| Never | 93.1 | 97.4 | 86.4 | |
| Once/twice | 4.1 | 1.9 | 7.6 | |
| Sometimes | 1.6 | 0.7 | 3.0 | |
| Often | 0.8 | 0.0 | 2.1 | |
| Very often | 0.5 | 0.1 | 1.0 | |
| Lived with someone who was depressed or mentally ill | n=1746 | n=1055 | n=691 | 0.000 |
| | 17.1 | 14.1 | 21.6 | |
| Lived with someone who was a problem drinker or alcoholic | n=1752 | n=1058 | n=694 | 0.155 |
| | 20.8 | 19.7 | 22.5 | |

¹ n=1,902 (1,156 males, 746 females)

Table 22. Emotional and Mental Health Indicators for Study Sample by Gender¹ (continued)

| Emotional and mental health indicators from RAP survey | % Total (n=total non- missing) | % Males (n=total non- missing) | % Females (n=total valid responses) | χ^2 p-value |
|--|---|---|--|------------------|
| National Comorbidity Study Questions | | | | |
| Ever in an accident where you could have been killed but were not badly hurt | n=1730 37.6 | n=1042 40.8 | n=688 32.8 | 0.001 |
| Ever in an accident where you were injured and had to spend at least one night in hospital | n=1730 6.9 | n=1041 6.7 | n=689 7.3 | 0.670 |
| Ever saw close family member or friend being badly injured or killed | n=1725 20.4 | n=1037 19.2 | n=688 22.2 | 0.124 |
| Ever saw a stranger being badly injured or killed | n=1726 23.9 | n=1039 26.9 | n=687 19.5 | 0.000 |
| Ever seriously attacked, beaten up, or assaulted | n=1723 13.4 | n=1036 13.9 | n=687 12.7 | 0.461 |
| Ever threatened with a knife, gun, or other weapon | n=1721 26.0 | n=1034 31.0 | n=687 18.5 | 0.000 |
| Ever raped | n=1715 7.8 | n=1033 1.6 | n=682 17.0 | 0.000 |

¹ n=1,902 (1,156 males, 746 females)

Responses to RAP questions on tobacco use (Table 23) indicated that 42.1% had smoked a total of 100 or more cigarettes in their lifetime, approximately 40% smoked regularly at some point during their lifetime, and 31.8% had smoked on a regular basis for 2 or more years. The amount smoked differed by gender ($p=0.016$), with a greater proportion of males reporting they smoked a pack or more when they smoked regularly. Among smokers, over three-quarters (77.3%) had ever tried to quit and 31.7% initiated smoking before the legal age of 18. A greater proportion of males (20.3%) than females (19.4%) in this sample began smoking prior to age 16 ($p<0.001$).

Less than half (43.9%) of trainees smoked cigarettes in the year prior to basic training. Over a third (35.3%) had last smoked less than a month ago. Smokeless tobacco, pipe, and cigar use were all higher among males ($p<0.001$). Eighteen percent of males had used smokeless tobacco 3 or more times in the past year, 7.4% had been using smokeless tobacco for 2 or more years, and only 3.0% used a can or more a day. Over half (54.8%) of trainees lived with a smoker as a child.

Looking at reported alcohol use (Table 23), 70.8% of trainees under age 21 and 86.2% of those age 21 or older had consumed one or more alcoholic drinks in the past year. A greater proportion of males (41.2%) than females (38.1%) had their first alcoholic drink prior to age sixteen ($p=0.004$). Among trainees age 21 or older, a greater proportion of males (56.1%) than females (46.8%) had been drinking alcohol regularly for 2 or more years ($p=0.018$). Among trainees less than 21 years of age, the difference in the proportions of males (21.7%) and females (18.8%) who had been drinking regularly for 2 or more years was not statistically significant ($p=0.251$).

Indicators of alcohol misuse or abuse revealed that more than 20% of trainees scored five points or more on the first three AUDIT questions (AUDIT-C) and more than 20% of trainees also scored a one or more on the CAGE screening tool. Compared to females, a higher proportion of males had an AUDIT-C score above five ($p<0.001$) and a CAGE score above zero ($p=0.016$). Nineteen percent of all trainees in the sample had ever driven a car within 2 hours of having two or more alcoholic drinks.

Looking at risk behaviors related to motor vehicle injury (Table 23), a greater percentage of males (36.5%) than females (24.1%) reported having received two or more traffic tickets for moving violations such as speeding or running a red light ($p<0.001$). More males (5.3%) than females (2.6%) reported never wearing a seat belt when driving or riding in a car ($p=0.005$).

Sexual risk behavior questions (Table 23) showed that a third (33.2%) of this sample first had sexual intercourse at age 15 or younger. A greater proportion of males (14.9%) than females (10.4%) reported never having had sex ($p=0.006$). Over half (52.1%) used a condom the last time they had sex. More women (7.3%) than men (2.1%) reported having had a medically-confirmed sexually transmitted disease ($p<0.001$).

The last set of questions described in Table 23 addressed issues surrounding diet and other miscellaneous health behaviors. A third (33.6%) of incoming trainees reported getting six or less hours of sleep on most nights. Nearly two-thirds (63.7%) reported watching television for two or more hours a day. A greater proportion of males (30.0%) than females (24.8%) drank an average of four or more caffeinated beverages a day ($p=0.013$). A greater proportion of males (67.0%) than females (61.9%) also ate fast food two or more times per week ($p=0.029$). Approximately 20% of the trainees never ate breakfast.

Questions addressing weight and methods of weight control indicated that 42.2% of trainees reported weight changes in the past year. Of the three weight control methods included in the questionnaire, use of diet pills was the most common; 9.9% of males and 25.0% of females reported diet pill use. A greater proportion of females compared to males reported using diet pills, laxatives, and vomiting to lose weight ($p<0.001$). A greater proportion of males (2.3%) than females (0.9%), however, reported using steroids to lose weight or gain strength ($p=0.022$).

Finally, a greater percentage of males than females reported participating in vigorous physical activity four or more times per week (36.6% among males vs. 27.1% among females) in the year prior to basic training ($p<0.001$). Slightly more males (59.5%) than females (55.2%) reported participating on one or more sports teams during their last year of HS ($p=0.070$).

Table 23. Health and Health Risk Behaviors for Study Sample by Gender¹

| Health and health risk behaviors from RAP survey | % Total (n=total non-missing) | % Males (n=total non-missing) | % Females (n=total non-missing) | χ^2 p-value |
|--|-------------------------------|-------------------------------|---------------------------------|------------------|
| Tobacco Use | | | | |
| Ever smoked more than 100 cigarettes in life | n=1870 42.1 | n=1133 43.1 | n=737 40.6 | 0.284 |
| Ever tried to quit smoking cigarettes ² | n=722 77.3 | n=447 77.5 | n=275 76.9 | 0.504 |
| Smoked cigarettes in last year | n=1853 | n=1125 | n=728 | 0.358 |
| Not at all | 56.2 | 56.2 | 56.2 | |
| Some days | 18.6 | 17.7 | 19.9 | |
| Every day | 25.3 | 26.1 | 23.9 | |
| Age first started smoking | n=1788 | n=1094 | n=694 | 0.021 |
| Never smoked regularly | 58.3 | 59.0 | 57.2 | |
| 21 or older | 2.0 | 1.8 | 2.3 | |
| 18-20 years old | 7.9 | 7.1 | 9.2 | |
| 16-17 years old | 11.7 | 11.7 | 11.8 | |
| 14-15 years old | 10.3 | 11.8 | 7.9 | |
| 9-13 years old | 9.7 | 8.5 | 11.5 | |
| Years smoked >3 cigarettes on most days | n=1809 | n=1104 | n=705 | 0.997 |
| Never smoked regularly | 60.3 | 60.6 | 59.7 | |
| ≤ 1 year | 8.0 | 8.0 | 8.1 | |
| 2-4 years | 14.4 | 14.2 | 14.6 | |
| 5-7 years | 10.2 | 10.1 | 10.4 | |
| 8 or more years | 7.2 | 7.2 | 7.2 | |
| Packs smoked each day when smoked regularly | n=1802 | n=1100 | n=702 | 0.016 |
| Never smoked regularly | 61.0 | 61.2 | 60.8 | |
| Half pack or less | 17.4 | 15.8 | 19.8 | |
| 1 pack | 14.0 | 14.1 | 13.8 | |
| More than 1 pack | 7.6 | 8.9 | 5.6 | |
| When last smoked a cigarette | n=1840 | n=1118 | n=722 | 0.506 |
| Have never smoked | 45.2 | 44.3 | 46.5 | |
| > 1 year ago | 9.5 | 10.0 | 8.7 | |
| > 1 month ago | 10.1 | 10.8 | 9.0 | |
| > 1 week ago | 23.9 | 23.3 | 24.8 | |
| Within last few days | 11.4 | 11.6 | 10.9 | |
| Smoked pipe ≥3 times in past year | n=1802 4.7 | n=1081 6.8 | n=721 1.5 | 0.000 |
| Smoked cigar ≥3 times in past year | n=1817 18.8 | n=1093 24.4 | n=724 10.4 | 0.000 |
| Used smokeless tobacco ≥3 times in past year | n=1817 12.2 | n=1098 18.2 | n=719 3.1 | 0.000 |

¹ n=1,902 (1,156 males, 746 females)² Percent are out of 488 males and 299 females who reported smoking more than 100 cigarettes in their lifetime.

Table 23. Health and Health Risk Behaviors for Study Sample by Gender¹ (continued)

| Health and health risk behaviors from RAP survey, continued | % Total (n=total non-missing) | % Males (n=total non-missing) | % Females (n=total non-missing) | X ² p-value |
|--|----------------------------------|----------------------------------|------------------------------------|------------------------|
| Years used smokeless tobacco on most days | n=1812 | n=1105 | n=707 | 0.000 |
| Never used regularly | 90.7 | 86.2 | 97.9 | |
| ≤ 1 year | 4.5 | 6.4 | 1.6 | |
| 2-4 years | 2.5 | 4.0 | 0.3 | |
| 5-7 years | 1.2 | 1.8 | 0.3 | |
| 8 or more years | 1.0 | 1.6 | 0.0 | |
| Cans used each day | n=1803 | n=1104 | n=699 | 0.000 |
| Never used regularly | 91.2 | 86.8 | 98.1 | |
| Half can or less | 6.8 | 10.2 | 1.4 | |
| 1 can or more | 2.0 | 3.0 | 0.4 | |
| Anyone in childhood home smoked regularly | n=1817 | n=1100 | n=717 | 0.442 |
| | 54.8 | 54.1 | 55.9 | |
| Alcohol Use | | | | |
| During past year, had ≥1 alcoholic drink | n=1851 | n=1122 | n=729 | |
| <21 years of age | 70.8 | 70.5 | 71.4 | 0.747 |
| ≥ 21 years of age | 86.2 | 87.2 | 84.8 | 0.358 |
| Age when first had alcoholic drink | n=1843 | n=1116 | n=727 | 0.087 |
| Never had a drink | 13.5 | 13.9 | 12.8 | |
| 21 or older | 6.1 | 5.9 | 6.5 | |
| 18-20 years old | 15.8 | 13.8 | 19.0 | |
| 16-17 years old | 24.6 | 25.2 | 23.7 | |
| 14-15 years old | 19.9 | 20.6 | 18.7 | |
| 13 or younger | 20.1 | 20.6 | 19.4 | |
| Years been drinking alcohol regularly | n=1814 | n=1102 | n=712 | 0.717 |
| <21 years of age | | | | |
| Never had a drink | 18.7 | 19.1 | 18.0 | |
| Tried a few times | 47.8 | 46.0 | 50.6 | |
| 1 year or less | 13.0 | 13.2 | 12.6 | |
| 2-5 years | 17.9 | 19.0 | 16.2 | |
| 6-10 years | 2.4 | 2.4 | 2.2 | |
| 11 or more years | 0.4 | 0.3 | 0.4 | |
| ≥ 21 years of age | | | | 0.161 |
| Never had a drink | 5.9 | 6.4 | 5.2 | |
| Tried a few times | 29.6 | 26.1 | 34.8 | |
| 1 year or less | 12.0 | 11.3 | 13.1 | |
| 2-5 years | 31.9 | 33.7 | 29.2 | |
| 6-10 years | 13.1 | 14.5 | 10.9 | |
| 11 or more years | 7.4 | 7.9 | 6.7 | |
| Ever driven car within 2 hours of drinking ≥ 2 alcoholic drinks ² | n=1788 | n=1077 | n=711 | 0.001 |
| | 19.1 | 21.6 | 15.2 | |

¹ n=1,902 (1,156 males, 746 females)² Values represent % reporting "Yes, but >1 year ago" and "Yes, during past year".

Table 23. Health and Health Risk Behaviors for Study Sample By Gender¹ (continued)

| Health and health risk behaviors from RAP survey, continued | % Total (n=total non-missing) | % Males (n=total non-missing) | % Females (n=total non-missing) | χ^2 p-value |
|--|----------------------------------|----------------------------------|------------------------------------|------------------|
| In past year, how often had alcoholic drink | n=1765 | n=1065 | n=700 | 0.001 |
| Never | 22.2 | 22.3 | 21.9 | |
| Once/twice | 21.2 | 20.6 | 22.1 | |
| A few times | 23.6 | 21.3 | 27.1 | |
| Monthly | 10.6 | 10.0 | 11.4 | |
| Weekly | 18.9 | 21.3 | 15.3 | |
| Daily | 3.5 | 4.4 | 2.1 | |
| In past year, how often ≥ 6 drinks at one sitting | n=1755 | n=1057 | n=698 | 0.000 |
| Never | 50.6 | 47.7 | 55.0 | |
| Once/twice | 16.9 | 16.4 | 17.8 | |
| A few times | 14.1 | 13.3 | 15.2 | |
| Monthly | 6.7 | 8.1 | 4.6 | |
| Weekly | 10.4 | 12.8 | 6.9 | |
| Daily | 1.3 | 1.7 | 0.6 | |
| In past year, number of alcoholic drinks on typical day of drinking | n=1723 | n=1038 | n=685 | 0.000 |
| None | 26.3 | 26.6 | 25.8 | |
| 1-2 | 35.7 | 31.9 | 41.5 | |
| 3-4 | 15.9 | 14.6 | 17.8 | |
| 5-6 | 8.2 | 8.6 | 7.7 | |
| 7-9 | 6.4 | 8.3 | 3.6 | |
| 10 or more | 7.4 | 10.0 | 3.5 | |
| Ever failed to do what normally expected of you because of drinking ² | n=1817 | n=1093 | n=724 | 0.913 |
| | 8.8 | 8.7 | 8.8 | |
| You or someone else physically injured due to your drinking ² | n=1813 | n=1092 | n=721 | 0.131 |
| | 4.4 | 4.9 | 3.5 | |
| Ever felt you could not stop drinking once started ² | n=1791 | n=1080 | n=711 | 0.898 |
| | 6.4 | 6.5 | 6.3 | |
| AUDIT-C score (first 3) | n=1705 | n=1029 | n=676 | 0.000 |
| 0-5 | 79.4 | 74.4 | 87.0 | |
| 6-12 (hazardous drinker) | 20.6 | 25.6 | 13.0 | |

¹ n=1,902 (1,156 males, 746 females)² Values represent % reporting "Yes, but >1 year ago" and "Yes, during past year".

Table 23. Health and Health Risk Behaviors for Study Sample By Gender¹
(continued)

| Health and health risk behaviors from RAP survey, continued | % Total (n=total non-missing) | % Males (n=total non-missing) | % Females (n=total non-missing) | χ^2 p-value |
|---|----------------------------------|----------------------------------|------------------------------------|------------------|
| Alcohol Use: CAGE Questions | | | | |
| Ever felt needed to cut down on your drinking ² | n=1798 12.2 | n=1085 13.7 | n=714 9.9 | 0.016 |
| Ever felt annoyed because someone said you needed to cut down on your drinking ² | n=1796 6.1 | n=1083 6.4 | n=713 5.8 | 0.591 |
| Ever felt guilty after drinking ² | n=1794 11.0 | n=1084 10.9 | n=710 11.3 | 0.801 |
| Ever needed "eye-opener" in morning following day/night of heavy drinking ² | n=1797 3.7 | n=1083 4.1 | n=714 2.7 | 0.052 |
| Total CAGE score 0 1-4 (potential alc. abuse) | n=1789 20.7 | n=1083 22.2 | n=706 18.4 | 0.056 |
| Motor Vehicle Injury Risk Behaviors | | | | |
| # traffic tickets for moving violations | n=1748 | n=1053 | n=695 | 0.000 |
| None | 50.3 | 45.4 | 57.7 | |
| 1 | 18.1 | 18.1 | 18.1 | |
| 2 | 13.4 | 15.2 | 10.8 | |
| 3-4 | 12.0 | 13.6 | 9.6 | |
| 5 or more | 6.1 | 7.7 | 3.7 | |
| Wear a seat belt when driving/riding in car | n=1753 | n=1053 | n=700 | 0.004 |
| Always | 63.0 | 60.1 | 67.3 | |
| Usually | 18.5 | 19.6 | 16.9 | |
| Sometimes | 14.3 | 15.0 | 13.9 | |
| Never | 4.2 | 5.3 | 2.6 | |
| Sexual History | | | | |
| Age when first had sex | n=1716 | n=1040 | n=676 | 0.029 |
| Have never had sex | 13.1 | 14.9 | 10.4 | |
| 18 or older | 20.0 | 19.7 | 20.4 | |
| 16-17 | 33.7 | 31.9 | 36.4 | |
| 15 or younger | 33.2 | 33.5 | 32.8 | |
| Used condom last time had sex | n=1494 52.1 | n=887 52.4 | n=607 51.7 | 0.792 |
| Ever told had sexually transmitted disease | n=1719 4.2 | n=1036 2.1 | n=683 7.3 | 0.000 |

¹ n=1,902 (1,156 males, 746 females)² Values represent % reporting "Yes, but >1 year ago" and "Yes, during past year".

Table 23. Health and Health Risk Behaviors for Study Sample by Gender¹
(continued)

| Health and health risk behaviors from RAP survey, continued | % Total (n=total non-missing) | % Males (n=total non-missing) | % Females (n=total non-missing) | X ² p-value |
|---|----------------------------------|----------------------------------|------------------------------------|------------------------|
| Diet and Health | | | | |
| Hours of sleep on most nights | n=1833 | n=1106 | n=727 | 0.344 |
| 10 hours or more | 7.0 | 6.5 | 7.7 | |
| 9 hours | 14.8 | 13.7 | 16.5 | |
| 7-8 hours | 44.7 | 46.0 | 42.8 | |
| 6 hours | 18.7 | 18.9 | 18.3 | |
| 5 hours | 9.1 | 9.5 | 8.4 | |
| 4 hours or less | 5.8 | 5.4 | 6.3 | |
| Hours of TV on average day | n=1832 | n=1106 | n=726 | 0.248 |
| 0 | 5.7 | 5.1 | 6.6 | |
| 1 hour or less | 30.6 | 29.7 | 32.0 | |
| 2-3 hours | 45.0 | 46.6 | 42.6 | |
| 4 or more hours | 18.7 | 18.6 | 18.9 | |
| Amount of caffeinated beverages (average/day) | n=1831 | n=1104 | n=727 | 0.019 |
| 0 cups/bottles/cans | 11.7 | 12.0 | 11.3 | |
| 1 | 21.4 | 19.7 | 23.8 | |
| 2 | 21.1 | 19.4 | 23.8 | |
| 3 | 17.9 | 18.8 | 16.4 | |
| 4-5 | 16.8 | 17.9 | 15.0 | |
| 6 or more | 11.2 | 12.1 | 9.8 | |
| Ate fast food | n=1825 | n=1099 | n=726 | 0.049 |
| 0 times/week | 9.2 | 8.1 | 10.9 | |
| 1 | 25.8 | 24.9 | 27.1 | |
| 2-3 | 38.7 | 38.9 | 38.4 | |
| 4-7 | 19.2 | 20.7 | 16.9 | |
| 8-14 | 5.1 | 4.9 | 5.4 | |
| 15 or more | 2.0 | 2.5 | 1.2 | |
| Ate breakfast | n=1818 | n=1095 | n=723 | 0.514 |
| 5-7 times/week | 26.2 | 27.5 | 24.3 | |
| 3-4 times/week | 21.5 | 21.1 | 22.0 | |
| 1-2 times/week | 32.5 | 31.8 | 33.6 | |
| Never | 19.8 | 19.6 | 20.1 | |
| Weight in past year | n=1812 | n=1096 | n=716 | 0.025 |
| Stayed same | 57.8 | 58.1 | 57.3 | |
| Lost >10lbs, dieting | 12.0 | 11.7 | 12.6 | |
| Lost >10lbs, no dieting | 11.4 | 9.9 | 13.7 | |
| Gained >10 lbs | 18.8 | 20.3 | 16.5 | |

¹ n=1,902 (1,156 males, 746 females)

Table 23. Health and Health Risk Behaviors for Study Sample by Gender¹ (continued)

| Health and health risk behaviors from RAP survey, continued | % Total (n=total non-missing) | % Males (n=total non-missing) | % Females (n=total non-missing) | χ^2 p-value |
|--|----------------------------------|----------------------------------|------------------------------------|------------------|
| Ever taken diet pills to lose weight | n=1814 15.9 | n=1097 9.9 | n=717 25.0 | 0.000 |
| Ever taken laxatives to lose weight | n=1807 5.0 | n=1088 2.8 | n=719 8.3 | 0.000 |
| Ever caused yourself to vomit to lose weight | n=1811 3.1 | n=1091 1.4 | n=720 5.7 | 0.000 |
| Ever used steroids to lose weight or gain strength | n=1806 1.9 | n=1091 2.3 | n=715 0.9 | 0.022 |
| In typical week during past year, participation in vigorous activity | n=1803 | n=1088 | n=715 | 0.000 |
| 4 or more times/week | 32.8 | 36.6 | 27.1 | |
| 1-3 times/week | 53.4 | 52.0 | 55.4 | |
| Never | 13.8 | 11.4 | 17.5 | |
| Last year of HS, number of sports teams | n=1801 | n=1089 | n=712 | 0.151 |
| 3 or more | | | | |
| 2 | 12.7 | 12.2 | 13.3 | |
| 1 | 20.3 | 21.5 | 18.4 | |
| None | 24.9 | 25.8 | 23.5 | |
| | 42.2 | 40.5 | 44.8 | |

¹ n=1,902 (1,156 males, 746 females)

d. Health Risk Behaviors in the Study Sample vs. U.S. Population.

Table 24 presents the self-reported prevalence of selected health risk behaviors among 17-20 year olds in this sample of persons entering Army basic training in 2003, and samples from national surveys of youth behavior conducted between 2002 and 2004. All comparisons that follow should be interpreted with caution, as proportions reported for the Army sample may reflect the higher proportion of males (60%) in the sample.

Data presented in Table 24 indicate that, while a higher proportion of the U.S. young adult population initiated cigarette use prior to age thirteen (22.1%, vs. 14.7% in the Army sample), measures of lifetime and current cigarette use in the basic training sample fell between similar measures in the general population. The proportion of basic trainees reporting smokeless tobacco use in the past year (11.7%) was higher than proportions of the U.S. young adult population samples reporting smokeless tobacco use in the past month (7.8% and 8.2%). Cigar use three or more times in the past year among the Army sample (19.6%) was lower than reported cigar use in the past year among the U.S. young adult population (22.7%).

Measures of alcohol use in this sample of basic trainees compared to samples of the U.S. young adult population followed similar patterns. The percent of young adults in the general population who initiated alcohol use before age 13 (29.1%) was higher than the percent of basic trainees

who initiated alcohol use at age 13 or younger (21.7%). Reported lifetime alcohol use in the Army population (81.3%) fell between proportions reported in national samples (87.1% and 78.2%). Proportions of basic trainees reporting current alcohol use over the past year (81.3%) are higher than alcohol use in the past month reported by U.S. population samples (61.4% and 47.1%). Heavy alcohol use among general population samples (15.1% and 29.9%) was higher than the Army sample (10.7%), but definitions of “heavy alcohol use” differed in all three surveys. The proportion of Army trainees who reported drinking and driving in the past year (10.2%) was lower than the proportion of young adults in the general population who reported drinking and driving in the past month (13.3%).

Measures of physical activity indicated that the Army sample had a lower proportion of persons reporting regular vigorous activity (54.6%) compared to a sample of HS students (64.6%). Reported participation in sports teams was similar (57.5% vs. 55.2%, Army and general population, respectively). The proportion of the young adult general population that reported watching 3 or more hours of television a day (38.3%) was between the proportions of the Army sample reporting 2 to 3 hours of television viewing (42.5%) and 4 or more hours of viewing (20.6%) a day.

Looking at sexual health risk behaviors, 9.2% of the RAP sample reported first sexual intercourse at age 13 or younger, while 6.6% of the U.S. population sample had reported first sexual intercourse before age 13. Condom use was within 2% of the national response (59.3% vs. 57.9%, Army sample vs. national sample respectively).

Reported traffic tickets for a moving violation were higher in the Army RAP sample compared to the U.S. population, however the RAP survey asked for this information in regard to one’s lifetime (“*ever*”), while the YRBS asked for information regarding the last 12 months. Army trainees reporting using seat belts “sometimes or never” was slightly higher than HS students’ reports of “never or rare” use (14.7% vs. 14.1%, Army vs. U.S. samples respectively). Finally, steroid use prevalence was higher among the U.S. population sample (1.9% vs. 5.0%, Army vs. U.S. samples respectively).

Table 24. Comparison of Selected Health Risk Behaviors in the Study Sample and Selected U.S. Population Samples

| Specific survey questions by category of health risk behavior | Army, age 17-20 (RAP) ¹ % | U.S. Population, age 18-25 (SAMHSA) ² % | U.S. Population, grades 9-12 (YRBS) ³ % |
|---|---|---|---|
| Tobacco Use | | | |
| Age of initiation: Cigarette use before age 13 | 14.7 | | 22.1 |
| Lifetime cigarette use: Smoked more than 100 cigarettes in life | 35.8 | 70.2 | |
| Ever smoked part or all of a cigarette | | | 20.0 |
| Ever smoked ≥ 1 cigarette every day for 30 days | | | |
| Current cigarette use: Smoked cigarette less than 1 month ago | 32.2 | 40.2 | |
| Cigarette use in past month | | | 28.5 |
| Smoked ≥ 1 day in past 30 days | | | |
| Smokeless tobacco use: Smokeless tobacco use ≥ 3 times in past year | 11.7 | 7.8 | |
| Smokeless tobacco use in past month | | | 8.2 |
| Smokeless tobacco use ≥ 1 time in past 30 days | | | |
| Cigar use: Cigar use ≥ 3 times in past year | 19.6 | 22.7 | |
| Cigar use in past year | | | |

¹ Sample from current study (2003), age 17-20 years only, n=1,191² (Substance Abuse and Mental Health Services Administration (SAMHSA) 2004), n=22,738 (2003)³ (Grunbaum, Kann et al. 2002), n=13,601

Table 24. Comparison of Selected Health Risk Behaviors in the Sample Population and Selected U. S. Population Samples (continued)

| Specific Survey Questions By Category of Health Risk Behavior | U.S. Army, age 17-20 (RAP) ¹ % | U.S. Population, age 18-25 (SAMHSA) ² % | U.S. Population, grades 9-12 (YRBS) ³ % |
|--|--|---|---|
| Alcohol Use | | | |
| <i>Age of Initiation:</i> First drink at 13 years old or younger First drink before age 13 | 21.7 | | 29.1 |
| <i>Lifetime Alcohol Use:</i> Have been drinking alcohol on a regular basis Alcohol use in lifetime Ever had ≥ 1 drinks of alcohol | 81.3 | 87.1 | 78.2 |
| <i>Current Alcohol Use:</i> One or more alcoholic drink in past year Alcohol use in past month One or more alcoholic drink in past 30 days | 70.8 | 61.4 | 47.1 |
| <i>Heavy Alcohol Use:</i> Consumed ≥ 6 drinks at one sitting weekly or daily in past year Five or more drinks on the same occasion on 5 or more days in past 30 days Five or more drinks on ≥ 1 occasion on ≥ 1 days in past 30 days | 10.7 | 15.1 | 29.9 |
| <i>Drinking and Driving:</i> Drove within 2 hours of drinking ≥ 2 alcoholic drinks in past year Drove after drinking in past 30 days | 10.2 | | 13.3 |

¹ Sample from current study (2003), age 17-20 years only, n=1,191² (Substance Abuse and Mental Health Services Administration (SAMHSA) 2004), n=22,738³ (Grunbaum, Kann et al. 2002), n=13,601

Table 24. Comparison of Selected Health Risk Behaviors in the Sample Population and Selected U.S. Population Samples (continued)

| Specific survey questions by category of health risk behavior | U.S. Army, age 17-20 (RAP) ¹ % | U.S. Population, grades 9-12 (YRBS) ³ % |
|---|--|---|
| Physical Activity Behaviors | | |
| Vigorous activity: Participated in physical activity that made you sweat and breathe hard for at least 20 minutes \geq 3 times/week in a typical week during past year Participated in physical activity that made you sweat and breathe hard for \geq 20 minutes on \geq 3 days in 7 days preceding survey times | 54.6 | 64.6 |
| Participation in sports teams: Played on \geq 1 sports teams during last year of HS Played on \geq 1 sports teams during past 12 months | 57.5 | 55.2 |
| TV viewing: Hours watch television on an average day (2-3; 4 or more) Watched television \geq 3 hours per day during average school day | 42.5; 20.6 | 38.3 |
| Sexual Health Risk Behaviors | | |
| Age at first sexual intercourse: First sexual intercourse at age 13 or younger First sexual intercourse before age 13 | 9.2 | 6.6 |
| Condom use: You or partner used condom during last sexual intercourse | 59.3 | 57.9 |

¹ Sample from current study (2003), age 17-20 years only, n=1,191³ (Grunbaum, Kann et al. 2002), n=13,601

Table 24. Comparison of Selected Health Risk Behaviors in the Sample Population and Selected U.S. Population Samples (continued)

| Specific survey questions by category of health risk behavior | U.S. Army, age 17-20 (RAP) ¹ % | U.S. Population, grades 9-12 (YRBS) ³ % | U.S. Population, age 16-20 (NHTSA) ⁴ % |
|---|--|---|--|
| Injury-Related Behaviors | | | |
| Traffic Violations: One or more traffic tickets for moving violations ever (lifetime) Stopped ≥ 1 time for traffic violation in past 12 months | 39.0 | | 31.0 |
| Seat Belt Use: Seat belt never worn; never or sometimes worn Seat belt never or rarely worn | 3.7; 14.7 | 14.1 | |
| Other Behaviors | | | |
| Steroid Use: Ever used steroids | 1.9 | 5.0 | |

¹ Sample from current study (2003), age 17-20 years only, n=1,191³ (Grunbaum, Kann et al. 2002), n=13,601⁴ (Royal 2002), n=75

e. Creation of Health Risk Behavior Indices.

The evaluation of missing variables in health risk behavior indices indicated that the two measures containing five items had the highest percentages missing within the study sample: the alcohol use risk behavior index (14.2%) and the personal health risk behavior index (10.3%). The missing percentages for the remaining indices were as follows: the cigarette use index (7.8%), weight control index (5.5%), and smokeless tobacco use index (0.8%). Inclusion of trainees missing only one index item resulted in the following additions to analyses that follow: n=49 (cigarette use), n=32 (smokeless tobacco use), n=158 (alcohol use), n=120 (personal health risk behaviors), and n=17 (weight control).

Review of descriptive analyses (Table 23) on the 24 health risk behaviors under consideration for the indices revealed that steroid use was reported by less than 2% of the sample, so this health risk behavior was removed from consideration. Next, correlation coefficients were obtained for the remaining 23 risk factors considered for the risk indices (Appendix C). Table 25 shows correlations between variables measuring sexual behaviors were very low (that is, <0.10), suggesting that these measures were potentially invalid as an aggregate measure for a single construct of sexual risk. Preliminary factor analyses substantiated this finding, given the inconsistent behavior of the variable measuring age at first sexual intercourse; it grouped with alcohol use variables for males and cigarette use variables for females. These variables were dropped from further consideration for a risk index.

Table 25. Pearson Correlation Coefficients for Sexual Health Risk Behavior Items

| | STD | Age at first intercourse | Condom use |
|------------------------------------|-----|--------------------------|------------|
| Sexually transmitted disease (STD) | 1.0 | .07 | .06 |
| Age at first intercourse | | 1.0 | .07 |
| Condom use | | | 1.0 |

Preliminary factor analyses also resulted in the measure of “tickets for moving violations” grouping with measures of alcohol use. This variable was removed from consideration for inclusion in a risk index, given the desire to create a homogenous factor representing alcohol use and existing evidence that this potentially injury-producing behavior could have an association with injury during basic training on its own, as seen in other populations (Soderstrom, Ballesteros et al. 2001). In the factor analysis that followed, the variable measuring hours of sleep remained independent from other health risk behaviors, forming its own factor. Given that factors containing only one variable are not of value, this variable was removed from consideration. A final factor analysis was performed on the remaining eighteen measures of health risk behaviors. Five factors were produced, each with an eigenvalue greater than 1.00 (Table 26). While the first factor explained the majority of the variance, as shown by the scree plot (Figure 4), all five factors together explained 54.5% of the variance. Final factor loadings are presented in Table 27.

Results of the factor analysis supported the creation of the following five health risk behavior indices: cigarette smoking (three items), smokeless tobacco use (two items), alcohol use (five items), weight control practices (four items), and items reflecting personal lifestyle choices, hereafter referred to as diet/lifestyle choices (five items).

Table 26. Eigenvalues and Total Variance Explained by Five Factor Model

| Component | Eigenvalue | Percent of variance | Cumulative percent of variance |
|-----------|------------|---------------------|--------------------------------|
| 1 | 3.740 | 20.78 | 20.78 |
| 2 | 1.748 | 9.71 | 30.49 |
| 3 | 1.570 | 8.72 | 39.21 |
| 4 | 1.465 | 8.14 | 47.35 |
| 5 | 1.280 | 7.11 | 54.46 |

Table 27. Rotated Factor Loadings from Principal Components Analysis of Eighteen Health Risk Behavior Items

| Item | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|-------------------------|----------|----------|----------|----------|----------|
| Alcohol use | | | | | |
| Years had been drinking | 0.800 | | | | |
| AUDIT-C score | 0.786 | | | | |
| Drunk driving | 0.706 | | | | |
| CAGE score | 0.605 | | | | |
| Age at first drink | 0.569 | | | | |
| Cigarette use | | | | | |
| Years smoked | | 0.809 | | | |
| Age at first use | | 0.754 | | | |
| Packs smoked | | 0.716 | | | |
| Smokeless tobacco use | | | | | |
| Number of cans/packs | | | 0.916 | | |
| Years used | | | 0.915 | | |
| Diet/lifestyle choices | | | | | |
| Caffeine use | | | | 0.702 | |
| Fast food consumption | | | | 0.653 | |
| TV | | | | 0.566 | |
| Breakfast | | | | 0.468 | |
| Seat belt use | | | | 0.284 | |
| Weight control methods | | | | | |
| Laxative use | | | | | 0.753 |
| Diet pill use | | | | | 0.707 |
| Vomiting | | | | | 0.701 |

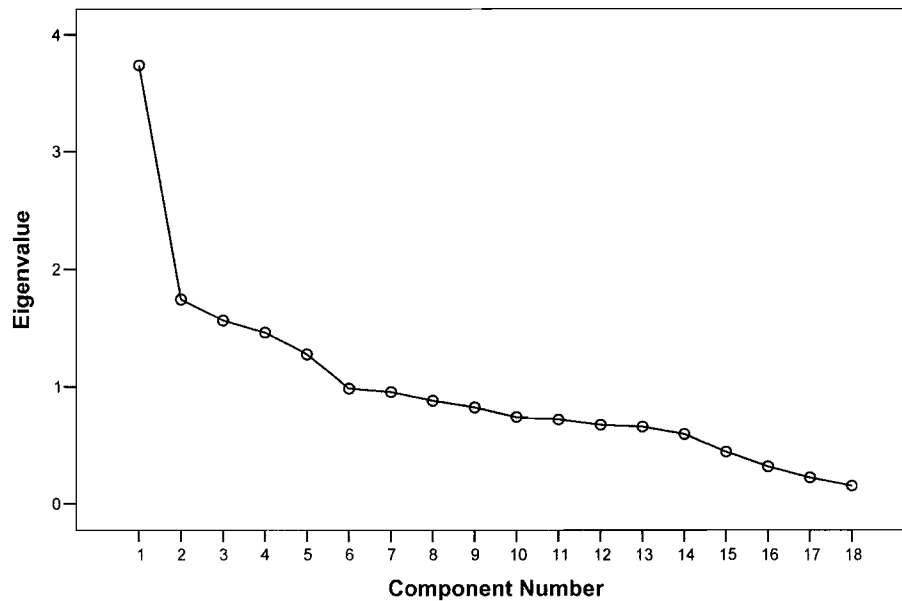


Figure 4. Scree Plot of Final Factor Analysis

Results of tests for internal consistency of the five factors resulting from the factor analysis are shown in Table 28 and distributions are presented in Appendix D. Although the table displays results for males and females, decisions focused on results for the total population. In all cases, results supported retaining the index items as shown in **bold**, given that improvements in the alpha coefficients for the total population were no greater than 0.003 with removal of any one variable within each index.

Table 28. Internal Consistency of Final Five Health Risk Behavior Indices

| Index | Variables/items | Cronbach Alpha Coefficients | | |
|--------------------------|---|-----------------------------|-------------------|--------------------|
| | | Total (n=1902) | Males (n=1156) | Females (n=746) |
| Cigarette use | Retain: Age first cigarette use, packs of cigarettes smoked, years smoked | 0.970 | 0.973 | 0.965 |
| | drop packs smoked | 0.944 | 0.949 | 0.937 |
| | drop age first cigarette use | 0.973 | 0.973 | 0.973 |
| | drop years smoked | 0.948 | 0.956 | 0.934 |
| Smokeless tobacco use | Retain: Cans/packs smokeless tobacco used, years used smokeless tobacco | 0.626 | 0.623 | 0.556 |
| Alcohol use | Retain: Age at first drink, years of alcohol use, AUDIT-C score, CAGE score, drinking and driving | 0.669 | 0.665 | 0.682 |
| | drop age at first drink | 0.581 | 0.573 | 0.601 |
| | drop years of alcohol use | 0.530 | 0.519 | 0.560 |
| | drop AUDIT-C score | 0.613 | 0.622 | 0.596 |
| | drop CAGE score | 0.659 | 0.659 | 0.664 |
| | drop drinking and driving | 0.672 | 0.666 | 0.690 |
| Diet/lifestyle choices | Retain: Hours of TV/day, caffeinated beverages/day, fast food eaten/week, breakfast eaten/week, seat belt use frequency | 0.449 | 0.432 | 0.471 |
| | drop TV viewing | 0.416 | 0.414 | 0.416 |
| | drop caffeine use | 0.316 | 0.283 | 0.360 |
| | drop fast food eaten | 0.350 | 0.356 | 0.339 |
| | drop breakfast eaten | 0.411 | 0.377 | 0.448 |
| | drop seat belt use | 0.445 | 0.419 | 0.482 |
| Weight control practices | Retain: Diet pill use, laxative use, vomiting | 0.502 | 0.497 | 0.478 |
| | drop diet pills | 0.446 | 0.553 | 0.368 |
| | drop laxatives | 0.348 | 0.318 | 0.341 |
| | drop vomiting | 0.428 | 0.402 | 0.418 |

The relationship of these low, medium, and high risk categories to the combined risk index are presented in Table 29. For nearly all individual indices, the relationship with the combined risk-taking index is as expected; those in the lowest risk categories for the individual health risk behavior indices have the lowest mean combined risk-taking score and those in the highest risk categories have the highest mean combined risk-taking score. The exception to this trend seen

with smokeless tobacco use among females was most likely due to the rareness of this behavior among women (<2%).

Table 29. Mean Combined Risk-Taking Index Score by Low/Medium/High Risk Category of Individual Health Risk Behavior Indices¹

| Index | Males | | Females | |
|--------------------------|-------|---------------------------|---------|---------------------------|
| | n | Mean combined score (±SD) | n | Mean combined score (±SD) |
| Cigarette use | | | | |
| Low risk | 665 | 44.7 (±25.1) | 419 | 45.7 (±23.4) |
| Medium risk | 76 | 103.1 (±35.3) | 52 | 96.0 (±33.0) |
| High risk | 361 | 129.7 (±33.9) | 242 | 115.8 (±24.8) |
| Smokeless tobacco use | | | | |
| Low risk | 966 | 64.5 (±39.4) | 698 | 71.7 (±40.4) |
| Medium risk | 64 | 143.7 (±33.5) | 11 | 129.2 (±47.4) |
| High risk | 81 | 159.5 (±37.9) | 3 | 107.0 (±51.0) |
| Alcohol use | | | | |
| Low risk | 507 | 46.6 (±31.8) | 376 | 52.8 (±33.0) |
| Medium risk | 336 | 85.5 (±40.1) | 236 | 84.5 (±33.8) |
| High risk | 239 | 126.3 (±44.3) | 94 | 120.9 (±34.5) |
| Diet/lifestyle choices | | | | |
| Low risk | 653 | 62.6 (±43.1) | 474 | 64.8 (±39.4) |
| Medium risk | 401 | 91.6 (±49.7) | 225 | 86.4 (±41.1) |
| High risk | 45 | 137.3 (±40.8) | 28 | 97.9 (±34.1) |
| Weight control practices | | | | |
| Low risk | 1070 | 74.8 (±48.2) | 662 | 68.0 (±38.0) |
| Medium risk | 16 | 123.1 (±39.9) | 46 | 115.9 (±36.2) |
| High risk | 8 | 184.1 (±37.3) | 12 | 154.7 (±40.6) |

¹p-values from one-way analysis of variance by gender were ≤ 0.001 for all indices

Table 30 compares the distribution of risk scores by risk category (low/medium/high) by gender. The proportions of low, medium, and high risk cigarette users are similar among males and females (p=0.902). However, due to the greater number of male smokeless tobacco users, a greater proportion of males were captured in the medium and high risk smokeless tobacco index categories. Similarly, due to a greater number of females using diet pills, laxatives, and vomiting to control weight, a greater proportion of females were captured in the medium and high risk weight control index categories. A higher proportion of males were high risk alcohol users (p<0.001). Distributions within the diet/lifestyle index were fairly similar, with a slightly greater proportion of females in the low risk category (p=0.042).

Table 30. Distribution of Risk Categories by Index and Gender

| Index | Category | Male % | Female % | p* |
|--------------------------|-------------|-----------|-------------|-------|
| Cigarette use | Low risk | 60.3 | 59.6 | 0.902 |
| | Medium risk | 6.9 | 7.4 | |
| | High risk | 32.8 | 33.0 | |
| Smokeless tobacco | Low risk | 86.9 | 98.0 | 0.000 |
| | Medium risk | 5.8 | 1.5 | |
| | High risk | 7.3 | 0.4 | |
| Alcohol use | Low risk | 46.9 | 53.3 | 0.000 |
| | Medium risk | 31.1 | 33.4 | |
| | High risk | 22.1 | 13.3 | |
| Weight control practices | Low risk | 97.8 | 91.9 | 0.000 |
| | Medium risk | 1.5 | 6.4 | |
| | High risk | 0.7 | 1.7 | |
| Diet/lifestyle choices | Low risk | 59.4 | 65.2 | 0.042 |
| | Medium risk | 36.5 | 30.9 | |
| | High risk | 4.1 | 4.0 | |

*from X^2 statistic

Table 31 shows the mean combined risk-taking index scores for all major categorical covariates by gender. Among both males and females, mean combined risk-taking scores were higher among trainees with the following characteristics: white race, married or other marital status, age 22 or older, earned a GED, joined the Regular Army, and overweight or obese. Among males, those who reported vigorous exercise four or more days a week prior to basic training had a higher mean combined risk-taking score, while females who reported never exercising vigorously prior to training had a higher mean combined risk-taking score.

Table 32 presents the correlation of the combined risk-taking score with continuous measures of fitness from the APFT. Among both males and females, the correlation between fitness and risk-taking was similar; those with lower levels of aerobic fitness (that is, slower run times) had higher combined risk-taking scores. The relationship with measures of muscle endurance followed this pattern as well; negative correlations between sit-ups or pushups and the combined risk-taking score indicated that males and females with higher levels of muscle endurance (that is, those who completed more sit-ups or pushups on the APFT) tended to have lower combined risk-taking scores.

Table 31. Mean Combined Risk-Taking Index Scores for Major Categorical Covariates by Gender

| Covariate | Category | Mean Combined Risk-Taking Score (\pm standard deviation) | |
|---|--------------------------------|--|--------------------|
| | | Males | Females |
| Race/ethnicity | White | 82.5 (\pm 50.7) | 80.8 (\pm 43.9) |
| | Black | 54.9 (\pm 34.4) | 59.6 (\pm 30.9) |
| | Hispanic | 65.1 (\pm 44.8) | 55.6 (\pm 35.6) |
| | p-value [†] | 0.000 | 0.000 |
| Marital status | Single | 73.7 (\pm 48.2) | 70.3 (\pm 41.4) |
| | Married or other | 91.2 (\pm 52.5) | 82.1 (\pm 38.7) |
| | p-value [†] | 0.000 | 0.004 |
| Age | 17-21 years old | 72.2 (\pm 47.8) | 68.9 (\pm 40.5) |
| | 22-37 years old | 85.7 (\pm 51.2) | 81.2 (\pm 41.5) |
| | p-value [†] | 0.000 | 0.000 |
| Education level | Some college or more | 66.1 (\pm 42.9) | 66.7 (\pm 39.2) |
| | GED | 108.4 (\pm 49.1) | 99.9 (\pm 41.2) |
| | HS graduate | 75.3 (\pm 48.4) | 71.6 (\pm 40.2) |
| | No HS diploma or still in HS | 61.5 (\pm 45.3) | 63.0 (\pm 40.5) |
| | p-value [†] | 0.000 | 0.000 |
| | | | |
| Component | Regular Army | 80.7(\pm 49.1) | 75.3 (\pm 40.8) |
| | Army Reserve or National Guard | 71.1(\pm 48.9) | 68.4 (\pm 41.5) |
| | p-value [†] | 0.002 | 0.034 |
| Vigorous activity prior to basic training | 4+ times/week | 92.9 (\pm 53.4) | 70.2 (\pm 39.3) |
| | 1-3 times/week | 77.1 (\pm 49.2) | 70.8 (\pm 41.3) |
| | never | 69.7 (\pm 46.2) | 81.7 (\pm 41.6) |
| | p-value [†] | 0.000 | 0.035 |
| BMI | normal | 72.4 (\pm 48.4) | 65.9 (\pm 40.7) |
| | underweight | 74.4 (\pm 48.7) | 69.9 (\pm 40.8) |
| | overweight or obese | 79.0 (\pm 49.9) | 81.3 (\pm 41.2) |
| | p-value [†] | 0.317 | 0.005 |

[†] p-value from t-test or ANOVA, separately for males and females

Table 32. Correlations between the Combined Risk-Taking Index and Continuous Covariates by Gender

| Covariate | Pearson Correlation Coefficients | | | |
|-------------------------|----------------------------------|---------|---------|---------|
| | Males | p-value | Females | p-value |
| Runtime on initial APFT | 0.140 | 0.01 | 0.107 | 0.01 |
| Pushups on initial APFT | -0.064 | 0.05 | -0.117 | 0.01 |
| Situps on initial APFT | -0.131 | 0.01 | -0.137 | 0.01 |

Figures 5 and 6 show the percentage of trainees in the high risk categories of individual health risk behavior indices according to their category of combined risk. Among both male and female trainees in the lowest combined risk-taking index category (>1 SD below the mean), none (0.0%) were in the high risk categories for any of the individual health risk indices. Among males in the highest combined risk index category (>2 SD from the mean), over 90% were also in the high risk cigarette use category, over 79% were in the high risk smokeless tobacco use category, and over 81% were in the high risk alcohol use category. However, despite their high combined risk-taking score, the majority (86%) of males in the highest combined risk category (>2 SD from the mean) were “low risk” with regard to weight control practices and 68% were “medium risk” with regard to diet/lifestyle choices.

Among females (Figure 6) in the highest combined risk index category (>2 SD from the mean), over 70% were also in the high risk cigarette use category, over 83% were in the high risk alcohol use category, and over 33% were in the high risk weight control practices category. Similar to what was seen among males, most female trainees (89%) in the highest combined risk category were either “low risk” or “medium risk” with regard to diet/lifestyle choices. In addition, due to the very small number of smokeless tobacco users among females, most females in the highest combined risk index category (>2 SD from the mean) were in the low risk smokeless tobacco use index category.

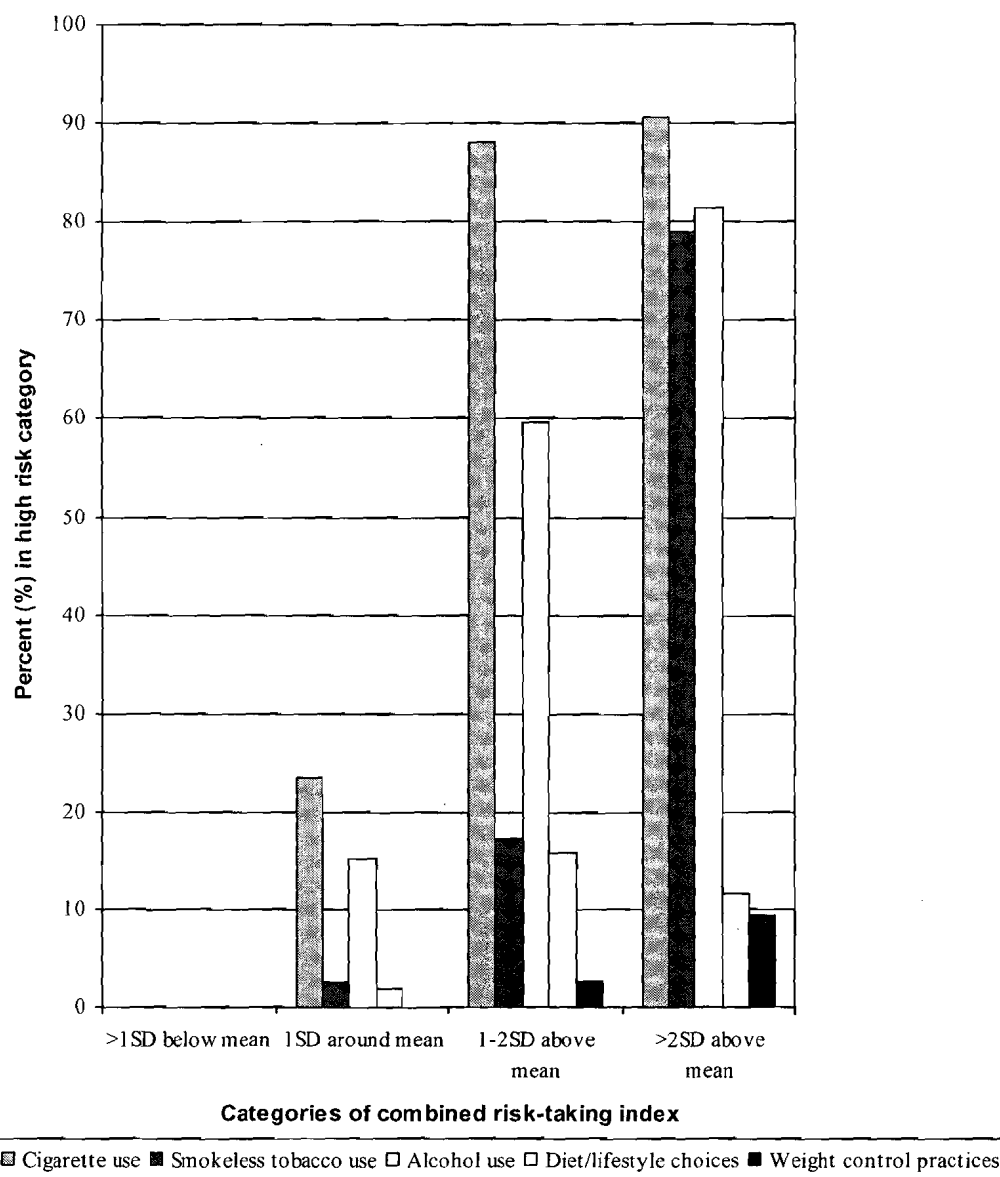


Figure 5. Percentage of Trainees in High Risk Categories of Individual Health Risk Behavior Indices by Category of Combined Risk-Taking Index, Males

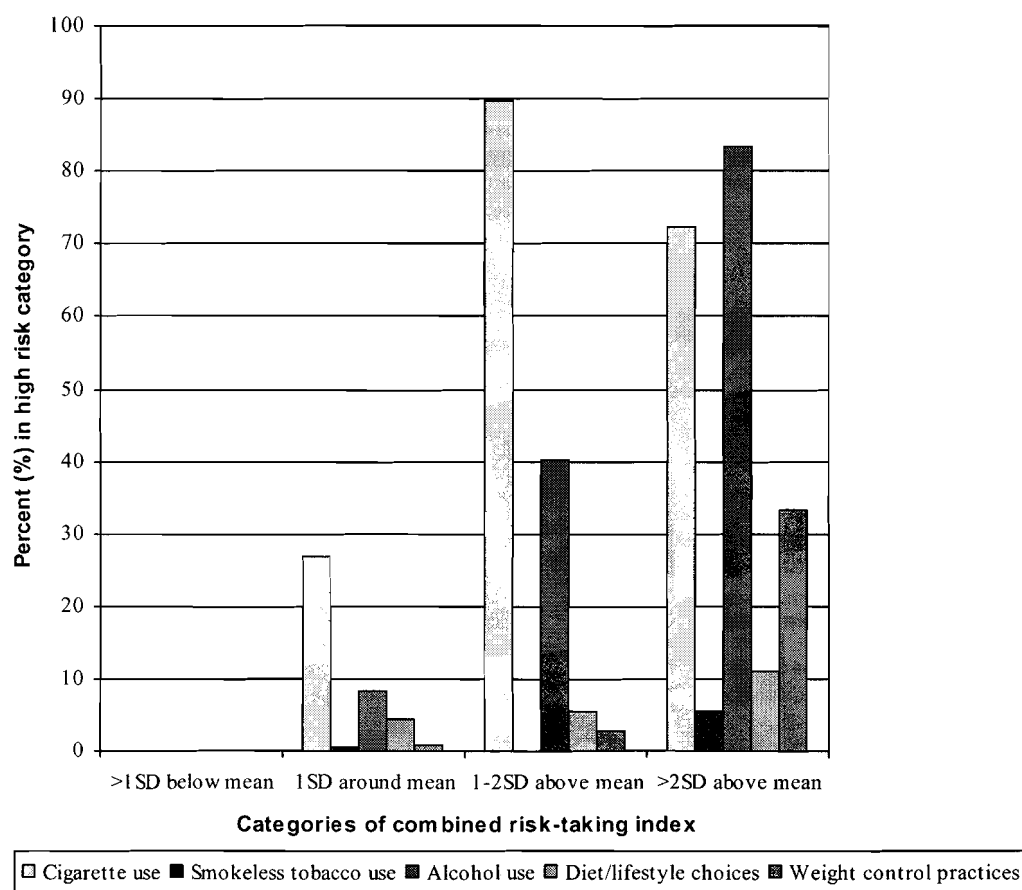


Figure 6. Percentage of Trainees in High Risk Categories of Individual Health Risk Behavior Indices by Category of Combined Risk-Taking Index, Females

Correlations of the individual health risk indices and the combined risk-taking index showed statistically significant correlations ($p=0.01$ level) of the combined risk-taking index with all individual risk indices for both men and women (Tables 33 and 34). Additionally, all correlations were positive. For both males and females, cigarette use was highly correlated with alcohol use and diet/lifestyle choices. For females, cigarette use was also correlated ($p=0.05$ level) with weight control practices and, for males, cigarette use was correlated with smokeless tobacco use. Also specifically among males, smokeless tobacco use was highly correlated with alcohol use, diet/lifestyle choices, and weight control practices. For both men and women, alcohol use was also significantly associated with weight control practices; for men only, alcohol use was significantly associated with diet/lifestyle choices.

Table 33. Spearman Rank Order Correlations of Individual Health Risk Behavior Indices and Combined Risk-Taking Index, Males (n=1,030)

| | Cigarette use index | Smokeless tobacco use index | Alcohol use index | Diet/lifestyle choices index | Weight control practices index | Combined risk-taking index |
|--------------------------------|---------------------|-----------------------------|--------------------------|------------------------------|--------------------------------|----------------------------|
| Cigarette use index | 1.0 | 0.337² | 0.418² | 0.227² | 0.052 | 0.811² |
| Smokeless tobacco use index | | 1.0 | 0.273² | 0.132² | 0.105² | 0.522² |
| Alcohol use index | | | 1.0 | 0.130² | 0.155² | 0.724² |
| Diet/lifestyle choices index | | | | 1.0 | 0.024 | 0.423² |
| Weight control practices index | | | | | 1.0 | 0.265² |
| Combined risk-taking index | | | | | | 1.0 |

² Significant at the 0.01 level

Table 34. Spearman Rank Order Correlations of Individual Health Risk Behavior Indices and Combined Risk-taking Index, Females (n=665)

| | Cigarette use index | Smokeless tobacco use index | Alcohol use index | Diet/lifestyle choices index | Weight control practices index | Combined risk-taking index |
|--------------------------------|---------------------|-----------------------------|--------------------------|------------------------------|--------------------------------|----------------------------|
| Cigarette use index | 1.0 | 0.064 | 0.343² | 0.119² | 0.095¹ | 0.809² |
| Smokeless tobacco use index | | 1.0 | 0.015 | 0.063 | 0.070 | 0.167² |
| Alcohol use index | | | 1.0 | 0.049 | 0.194² | 0.638² |
| Diet/lifestyle choices index | | | | 1.0 | 0.017 | 0.326² |
| Weight control practices index | | | | | 1.0 | 0.445² |
| Combined risk-taking index | | | | | | 1.0 |

¹ Significant at the 0.05 level² Significant at the 0.01 level

8. RESULTS PART II–THE ASSOCIATION OF HEALTH RISK BEHAVIORS AND TRAINING-RELATED INJURY (RESEARCH AIM B)

a. Unadjusted Cox Regression Analyses.

Time-to-first-injury for male and female trainees is displayed by injury type in the Kaplan-Meier plots of cumulative hazard (Figures 7-10). Regardless of injury type, females had a greater hazard of injury throughout training ($p<0.001$). Figure 7 demonstrates that half of the females were injured by approximately day 36 of training. One-quarter of male trainees were injured on or about 45 days into training. Similar patterns were seen for training-related injuries that received work limitations (Figure 10). Half way through training (day 32), approximately 25% of females and 10% of males had sustained an overuse injury (Figure 8). At this same time point, half way through training, approximately 12% of females and 5% of males had sustained a traumatic injury (Figure 9).

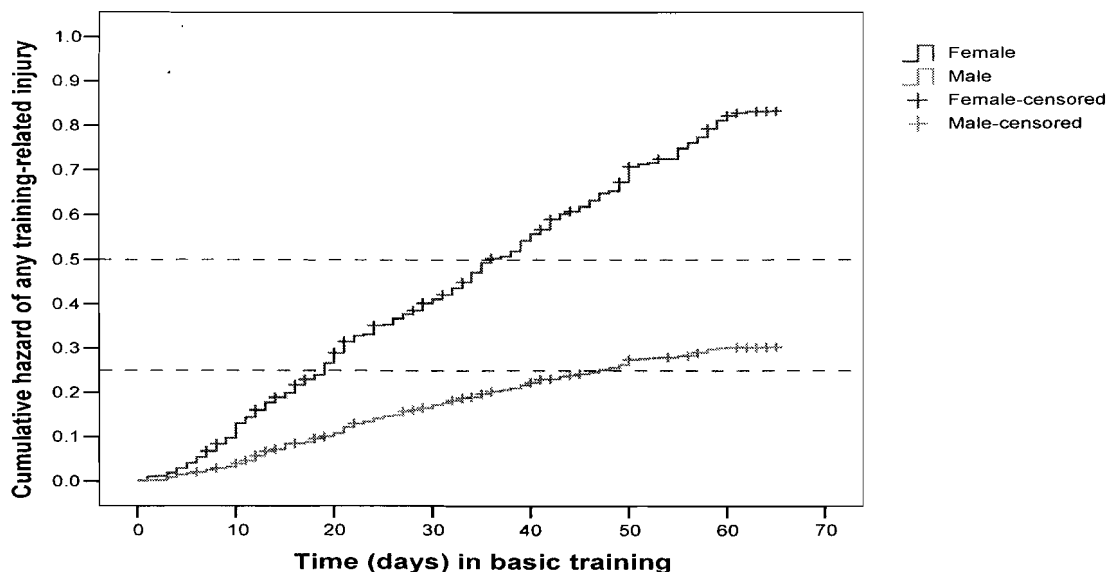


Figure 7. Time to First Training-Related Injury by Gender

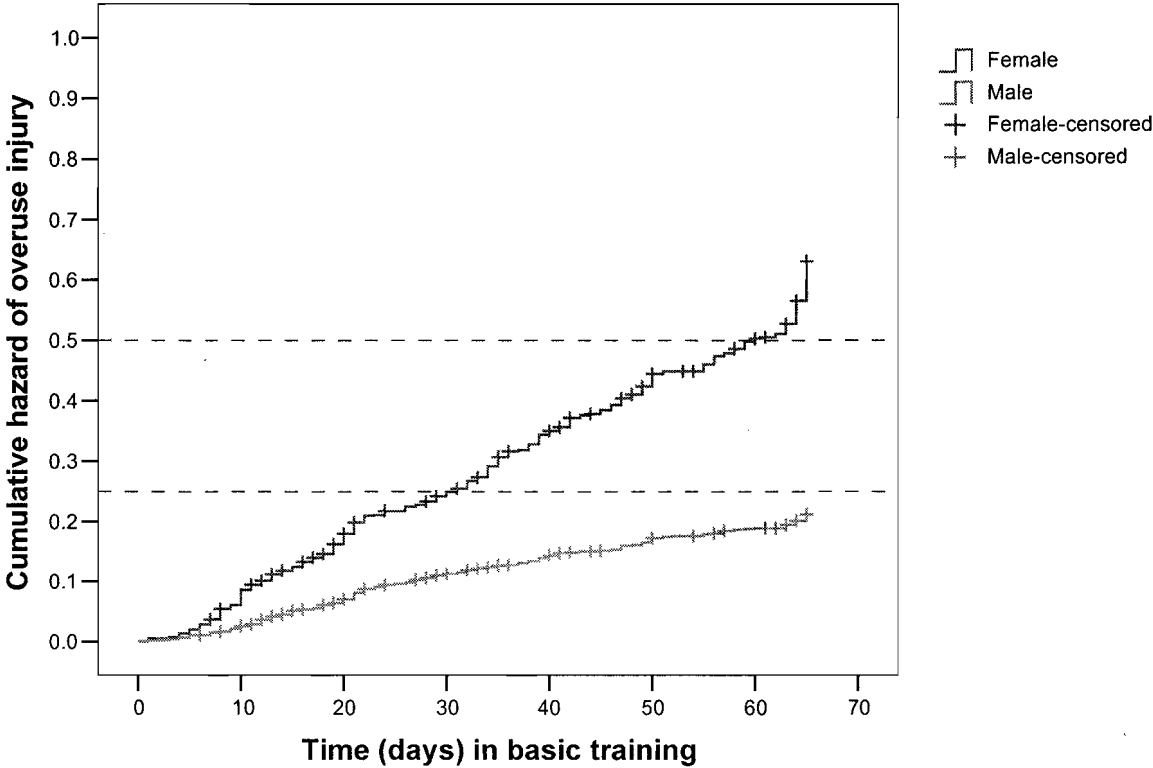


Figure 8. Time to First Overuse Training-Related Injury

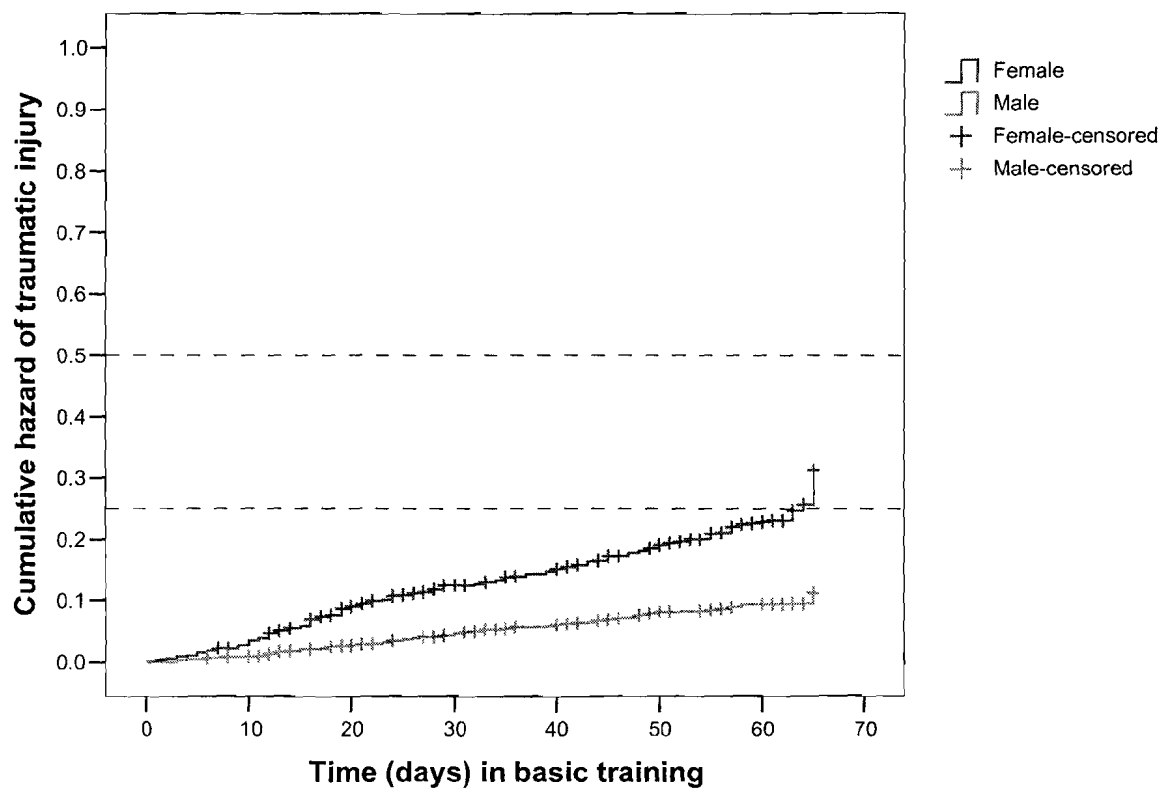


Figure 9. Time to First Traumatic Training-Related Injury

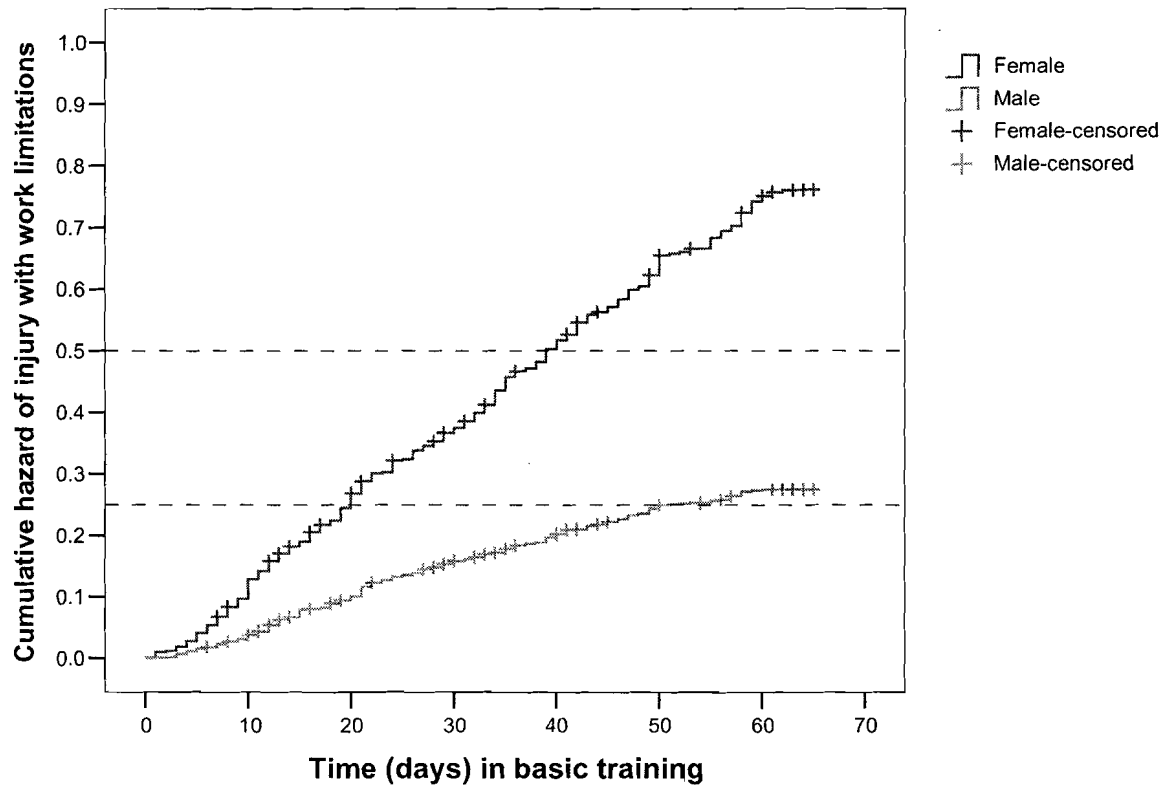


Figure 10. Time to First Training-Related Injury with Work Limitations

Tables 35-38 show the unadjusted HR and 95% confidence intervals (95%CI) for univariate relationships of any training-related injury with the combined risk-taking index, individual health risk indices, and selected social and physiologic covariates for males and females in the sample. Looking first at the combined risk index, while not associated as a continuous variable, males in the highest combined risk-taking category ($>2SD$ above the mean combined risk score) had twice the risk of any training-related injury compared to males within one standard deviation of the mean male combined risk score (HR: 2.0, 95%CI: 1.4, 2.8). Additionally, a trend existed such that injury hazard increased with increasing distance from the mean combined score. Such an association and trend were not observed among females.

Continuous measures of the individual risk indices (Table 35) were not associated with training-related injury risk among males. Among females, however, with each unit increase in the cigarette use and diet/lifestyle choices risk scores, training-related injury risk increased by 0.8% and 0.7% respectively. Among the categorical risk indices (low/medium/high risk) variables, only the cigarette use index among males and cigarette use and diet/lifestyle choice indices among females showed associations with training-related injury risk. More specifically, females in the high risk category of cigarette use had a 1.5 times greater risk of training-related injury compared to females in the low risk category (HR: 1.5, 95%CI: 1.1, 2.0). Among males, those in the medium risk category had a 1.5 times greater of injury compared to those in the low risk category (HR: 1.5, 95%CI: 1.4, 1.6). While the high risk cigarette use category showed a similar hazard, it did not reach statistical significance. The categorical diet/lifestyle risk index variable for females indicated an 18% greater risk of training-related injury for females in the medium risk category and 63% greater risk of injury for females in the high risk category.

Table 36 presents the unadjusted association of health risk behaviors not in an index with any training-related injury. Compared to females who never received a ticket for a moving violation, those who received one to two tickets had a slightly higher injury hazard (HR: 1.09, 95%CI: 1.06, 1.11). This relationship was not seen among males.

Sexual risk behaviors (Table 36) were not associated with training-related injury risk for females. However, males who had sex for the first time between the ages of 16 and 17 had a 40% greater risk of injury (HR: 1.4, 95%CI: 1.2, 1.7). A similar, but not statistically significant, result was seen for males who reported sex for the first time at age 16 or younger. Compared to males who had never had sex, those who reported not using condoms had an elevated risk of injury (HR: 1.4, 95%CI: 1.1, 1.9).

Table 37 shows the unadjusted associations of social covariates with any training-related injury. Among females, the only variable with a statistically significant association with injury was the Army component which they had joined. In this unadjusted model, females who enlisted in the Army Reserves or National Guard had lower risk of injury relative to their female peers who had enlisted in the Regular Army (HR: 0.8, 95%CI: 0.7, 0.9). The trend among males was similar but not statistically significant.

Among males, educational level was associated with any training-related injury (Table 37). Males with a GED (HR: 1.8, 95%CI: 1.4, 2.3) or no HS diploma (HR: 1.3, 95%CI: 1.1, 1.6) had statistically significant higher injury hazard compared to those with some college or more. In addition, male Hispanics in this sample had a lower risk of injury compared to white males.

Table 38 presents the results of unadjusted associations of physiologic covariates considered for the multivariate model. For females, all continuous measures of initial APFT results had statistically significant associations with training-related injury, such that females demonstrating higher aerobic fitness (faster run times) and higher muscle endurance (more sit-ups, more push-ups) had lower risks of injury (HR: 1.2, 95%CI: 1.1, 1.2; HR: 0.98, 95%CI: 0.97, 0.99; HR: 0.98, 95%CI: 0.97, 0.99, female run time, sit-ups, and push-ups respectively). Among males, a similar relationship existed for run time (HR: 1.2, 95%CI: 1.1, 1.4) and push-up performance (HR: 0.98, 95%CI: 0.97, 0.99). All categorical measures of fitness for both males and females showed a similar trend, although statistical significance was not always achieved; the hazard of injury compared to quartile one (most fit) increased for each successive quartile of decreasing fitness. As an example, the hazard of training-related injury is approximately 10, 60, and 80% higher among quartiles of males with successively slower run times.

Reported levels of the frequency of prior vigorous physical activity (Table 38) were also associated with training-related injury. Among both males and females, those who reported never exercising vigorously in a typical week during the past year had greater risk of injury compared to those who exercised four or more times a week (HR: 1.4, 95%CI: 1.3, 1.5 and HR: 1.5, 95%CI: 1.2, 1.8, males and females respectively). Continuous measures of age indicated that, for both males and females, the hazard of injury increased with increasing age (HR: 1.03, 95%CI: 1.02, 1.05 and HR: 1.02, 95%CI: 1.01, 1.02, males and females respectively). While continuous measures of BMI did not indicate an association with injury, categorical measures of BMI suggested an increased risk of injury for the overweight and obese group (BMI=25.0 or higher) among both males and females (HR: 1.2, 95%CI: 1.1, 1.4 and HR: 1.2, 95%CI: 1.0, 1.4, males and females respectively).

Table 35. Unadjusted Association of Health Risk Behavior Indices with Training-Related Injury by Gender

| | | Males | | | | | Females | | | | |
|---|---------------------------------------|-------|--------------|----------|----------|---------|---------|--------------|----------|----------|---------|
| Index | Categories | n | Hazard Ratio | 95%CI LL | 95%CI UL | p-value | n | Hazard Ratio | 95%CI LL | 95%CI UL | p-value |
| Combined risk-taking index | | | | | | | | | | | |
| Combined risk-taking index | continuous | 1030 | 1.004 | 0.997 | 1.010 | 0.276 | 665 | 1.003 | 0.998 | 1.008 | 0.266 |
| Combined risk-taking index, categorical | Average risk-taking (1SD around mean) | 698 | ref | | | | 412 | ref | | | |
| | Low risk-taking (>1SD below mean) | 138 | 1.304 | 0.956 | 1.777 | 0.093 | 128 | 0.818 | 0.656 | 1.020 | 0.075 |
| | High risk-taking (1-2SD above mean) | 151 | 1.429 | 0.649 | 3.146 | 0.375 | 107 | 1.061 | 0.845 | 1.332 | 0.611 |
| | Highest risk-taking (>2SD above mean) | 43 | 2.042 | 1.286 | 3.244 | 0.002 | 18 | 0.930 | 0.390 | 2.215 | 0.869 |
| Individual health risk behavior indices | | | | | | | | | | | |
| Cigarette use | continuous | 1102 | 1.007 | 0.997 | 1.017 | 0.193 | 703 | 1.008 | 1.001 | 1.014 | 0.022 |
| Smokeless tobacco use | continuous | 1111 | 1.005 | 0.994 | 1.016 | 0.388 | 712 | 0.988 | 0.964 | 1.012 | 0.315 |
| Alcohol use | continuous | 1082 | 1.006 | 0.991 | 1.021 | 0.452 | 706 | 1.001 | 0.992 | 1.009 | 0.140 |
| Diet/lifestyle choices | continuous | 1099 | 1.003 | 0.990 | 1.015 | 0.689 | 727 | 1.007 | 1.006 | 1.008 | 0.000 |
| Weight control practices | continuous | 1094 | 1.006 | 0.996 | 1.016 | 0.231 | 720 | 1.000 | 0.984 | 1.015 | 0.966 |
| Cigarette use | low risk | 665 | ref | | | | 419 | ref | | | |
| | medium risk | 76 | 1.454 | 1.347 | 1.571 | 0.000 | 52 | 1.336 | 0.844 | 2.113 | 0.217 |
| | high risk | 361 | 1.426 | 0.771 | 2.637 | 0.258 | 232 | 1.491 | 1.096 | 2.029 | 0.011 |
| Smokeless tobacco use | low risk | 966 | ref | | | | 698 | ref | | | |
| | medium risk | 64 | 1.385 | 0.694 | 2.765 | 0.355 | 11 | n/r | | | |
| | high risk | 81 | 1.198 | 0.705 | 2.037 | 0.505 | 3 | n/r | | | |
| Alcohol use | low risk | 507 | ref | | | | 376 | ref | | | |
| | medium risk | 336 | 1.106 | 0.859 | 1.423 | 0.434 | 236 | 1.015 | 0.879 | 1.172 | 0.843 |
| | high risk | 239 | 1.353 | 0.703 | 2.605 | 0.365 | 94 | 1.044 | 0.763 | 1.428 | 0.787 |
| Diet/lifestyle choices | low risk | 653 | ref | | | | 474 | ref | | | |
| | medium risk | 401 | 1.177 | 0.913 | 1.517 | 0.208 | 225 | 1.175 | 1.122 | 1.232 | 0.000 |
| | high risk | 45 | 0.619 | 0.339 | 1.129 | 0.118 | 28 | 1.631 | 1.288 | 2.066 | 0.000 |
| Weight control practices | low risk | 1070 | ref | | | | 662 | ref | | | |
| | medium risk | 16 | 1.266 | 0.571 | 2.809 | 0.562 | 46 | 1.023 | 0.423 | 2.474 | 0.960 |
| | high risk | 8 | 0.995 | 0.413 | 2.396 | 0.991 | 12 | 1.221 | 0.457 | 3.265 | 0.690 |

Table 36. Unadjusted Association of Health Risk Behaviors Not in an Index with Training-Related Injury by Gender

| VariableCategories | | Males | | | | Females | | | |
|---------------------------------|-------------------|-------|--------------|----------|----------|---------|--------------|----------|----------|
| | | n | Hazard Ratio | 95%CI LL | 95%CI UL | n | Hazard Ratio | 95%CI LL | 95%CI UL |
| Moving violations | none | 478 | ref | | | 401 | ref | | |
| | 1 to 2 | 351 | 0.950 | 0.781 | 1.154 | 201 | 1.085 | 1.056 | 1.114 |
| | 3 or more | 224 | 1.182 | 0.826 | 1.693 | 93 | 0.955 | 0.777 | 1.173 |
| Age at first sexual intercourse | Never had sex | 155 | ref | | | 70 | ref | | |
| | 18 years or older | 205 | 1.009 | 0.682 | 1.491 | 138 | 1.355 | 0.675 | 2.724 |
| | age 16 to 17 | 332 | 1.425 | 1.231 | 1.650 | 246 | 1.217 | 0.690 | 2.145 |
| | <age 16 | 348 | 1.351 | 0.989 | 1.847 | 222 | 1.339 | 0.638 | 2.810 |
| Condom use last time had sex | Never had sex | 152 | ref | | | 12 | ref | | |
| | Yes | 465 | 1.374 | 1.026 | 1.839 | 70 | 1.383 | 0.757 | 2.529 |
| | No | 422 | 1.443 | 1.126 | 1.848 | 314 | 1.412 | 0.801 | 2.491 |
| Ever diagnosed with STD | No | 22 | ref | | | 50 | ref | | |
| | Yes | 1014 | 0.692 | 0.316 | 1.519 | 633 | 1.126 | 0.858 | 1.477 |

Table 37. Unadjusted Associations of Social Covariates with Training-Related Injury by Gender

| Variable | Categories | Male | | | | Female | | | |
|-------------------|------------------------------|------|--------------|----------|----------|--------|--------------|----------|----------|
| | | n | Hazard Ratio | 95%CI LL | 95%CI UL | n | Hazard Ratio | 95%CI LL | 95%CI UL |
| Race/ethnicity | White | 779 | ref | | | 288 | ref | | |
| | Black | 151 | 0.862 | 0.600 | 1.238 | 405 | 1.055 | 0.982 | 1.133 |
| | Hispanic | 136 | 0.647 | 0.513 | 0.816 | 190 | 0.999 | 0.691 | 1.446 |
| Educational level | Some college or more | 130 | ref | | | 94 | ref | | |
| | GED | 152 | 1.809 | 1.435 | 2.281 | 73 | 1.706 | 0.793 | 3.670 |
| | HS graduate | 679 | 1.165 | 0.979 | 1.385 | 489 | 1.122 | 0.684 | 1.843 |
| | No HS diploma or still in HS | 193 | 1.303 | 1.081 | 1.570 | 87 | 0.948 | 0.498 | 1.804 |
| Component | Regular Army | 627 | ref | | | 464 | ref | | |
| | Reserves/National Guard (NG) | 529 | 0.902 | 0.772 | 1.053 | 282 | 0.797 | 0.699 | 0.909 |
| Army pay grade | E1 | 633 | ref | | | 163 | ref | | |
| | E2 | 231 | 1.007 | 0.794 | 1.276 | 377 | 0.925 | 0.768 | 1.114 |
| | E3 | 222 | 1.147 | 0.679 | 1.936 | 145 | 0.864 | 0.730 | 1.023 |
| | E4 | 70 | 0.758 | 0.518 | 1.107 | 183 | 0.525 | 0.189 | 1.463 |
| Marital status | Single | 968 | ref | | | 599 | ref | | |
| | Married or other | 181 | 1.247 | 0.794 | 1.958 | 144 | 1.144 | 0.741 | 1.764 |

Table 38. Unadjusted Associations of Physiologic Covariates with Training-Related Injury by Gender

| Variable | Categories | Males | | | | Females | | | |
|--------------------------------|--------------------------|-------|--------------|----------|----------|---------|--------------|----------|----------|
| | | n | Hazard Ratio | 95%CI LL | 95%CI UL | n | Hazard Ratio | 95%CI LL | 95%CI UL |
| Run time on initial APFT | continuous | 1115 | 1.168 | 1.103 | 1.361 | 93 | 1.153 | 1.081 | 1.231 |
| Sit-ups on initial APFT | continuous | 1121 | 0.981 | 0.963 | 1.000 | 717 | 0.976 | 0.967 | 0.985 |
| Push-ups on initial APFT | continuous | 1121 | 0.983 | 0.972 | 0.994 | 722 | 0.980 | 0.972 | 0.988 |
| Run time quartiles | Q1(fastest) | 284 | ref | | | 721 | ref | | |
| | Q2 | 265 | 1.136 | 1.144 | 1.514 | 188 | 1.543 | 1.348 | 1.767 |
| | Q3 | 276 | 1.641 | 1.584 | 1.700 | 176 | 1.576 | 1.351 | 1.839 |
| | Q4(slowest) | 291 | 1.801 | 1.591 | 2.039 | 174 | 2.137 | 1.994 | 2.292 |
| Sit-up quartiles | Q1(most) | 255 | ref | | | 181 | ref | | |
| | Q2 | 245 | 1.065 | 1.025 | 1.107 | 165 | 1.461 | 1.402 | 1.522 |
| | Q3 | 284 | 1.339 | 0.949 | 1.890 | 154 | 1.502 | 1.388 | 1.627 |
| | Q4(least) | 337 | 1.416 | 1.216 | 1.650 | 188 | 1.889 | 1.694 | 2.106 |
| Push-up quartiles | Q1(most) | 244 | ref | | | 215 | ref | | |
| | Q2 | 261 | 0.912 | 0.825 | 1.007 | 157 | 1.231 | 0.996 | 1.521 |
| | Q3 | 286 | 1.106 | 1.037 | 1.179 | 188 | 1.336 | 1.083 | 2.070 |
| | Q4(least) | 330 | 1.603 | 1.485 | 1.731 | 174 | 1.487 | 1.083 | 2.040 |
| Vigorous exercise in past year | 4+ times/week | 398 | ref | | | | ref | | |
| | 1-3 times/week | 566 | 0.980 | 0.778 | 1.212 | 194 | 1.185 | 0.986 | 1.424 |
| | never | 124 | 1.379 | 1.256 | 1.515 | 396 | 1.481 | 1.220 | 1.797 |
| Age | continuous | 1156 | 1.032 | 1.016 | 1.049 | 125 | 1.017 | 1.012 | 1.022 |
| Age groups | 17-20 years old | 733 | ref | | | | ref | | |
| | 21-37 years old | 423 | 1.120 | 0.883 | 1.419 | 458 | 1.191 | 1.010 | 1.405 |
| Body mass index (BMI) | continuous | 1156 | 1.011 | 0.982 | 1.042 | 19 | 0.998 | 0.982 | 1.015 |
| BMI groups - option 1 | normal (<18.5) | 627 | ref | | | 746 | ref | | |
| | underweight (18.5-24.9) | 27 | 1.194 | 0.402 | 3.541 | 511 | 1.665 | 1.037 | 2.675 |
| | overweight (25.0-29.9) | 388 | 1.314 | 1.190 | 1.452 | 40 | 1.141 | 0.948 | 1.373 |
| | obese (30.0+) | 114 | 0.955 | 0.749 | 1.217 | 189 | 2.409 | 0.949 | 6.116 |
| BMI groups - option 2 | normal (<18.5) | 627 | ref | | | 6 | ref | | |
| | underweight (18.5-24.9) | 27 | 1.194 | 0.402 | 3.541 | 511 | 1.665 | 1.037 | 2.674 |
| | overwgt or obese (25.0+) | 502 | 1.229 | 1.078 | 1.401 | 40 | 1.168 | 1.009 | 1.353 |

b. Multivariate Cox Regression Analyses.

For age, BMI, and the individual health risk behavior indices, the categorical forms of these variables showed univariate associations with training-related injury and were subsequently included in the multivariate analyses. For initial APFT results, continuous forms of the variables were retained in the multivariate analyses. Pay grade was dropped from consideration, given that univariate analyses indicated it was not significantly associated with training-related injury.

Other variables were excluded from multivariate analyses due to small sample sizes and concerns about the instability of statistical results using these measures. The excluded variables were as follows: STD diagnosis (n=22 males) for males, weight control practices index (n=24 medium and high risk males) for males, and smokeless tobacco use index (n=14 female smokeless tobacco users) for females.

(1) Any Training-Related Injury–Males

Results of the multivariate modeling steps used to test the association of any training-related injury among males with the combined risk-taking index and individual risk indices are shown in Tables 39-41. In the unadjusted (univariate) model (Table 39, Model 1), males with the highest combined risk-taking scores (greater than two standard deviations above the mean score) had twice the hazard of training-related injury compared to those whose scores were within one standard deviation of the mean (HR: 2.0, 95%CI: 1.3, 3.2). In the second modeling step, social covariates were added and the combined risk-taking index, education level, and race remained in the model. Results with the inclusion of all social variables are shown in Table 39, Model 2. Component (Regular Army or Reserves/National Guard) was no longer statistically significant. The interaction between education and race was tested, but was not statistically significant.

In the third modeling step (Table 39, Model 3), physiologic covariates were added. The following variables remained in the model: the combined risk-taking index, education level, race/ethnicity, and run time on the initial APFT. An interaction was found between race/ethnicity and age; as a result, analyses that follow show hazard ratios by race within age groups.

Based on the results of the previous modeling steps, the social and physiologic covariates included in the final model testing the association of the combined risk-taking index with training-related injury among males were as follows: education level, initial APFT run time, race/ethnicity, age, and the interaction of race/ethnicity and age. The hazard ratios and 95% confidence intervals of covariates in this model are shown in Table 40. After adjusting for aerobic fitness, age, race, and education, males in the highest combined risk-taking index had a 2.4 times greater risk of training-related injury compared to those within one standard deviation of the mean combined risk-taking index (HR: 2.4, 95%CI: 1.6, 3.6). In addition, males with the lowest combined risk-taking scores had a 1.5 times greater risk of injury compared to those with average risk-taking scores (HR: 1.5, 95%CI: 1.1, 2.0).

The final adjusted model testing the association of the combined risk-taking index and individual health risk behavior indices with training-related injury among males contained the following

covariates: combined risk-taking index, cigarette use index, run time on the initial APFT, education level, race/ethnicity, age, and the interaction between race and age. The hazard ratios and 95% confidence intervals are shown in Table 41. Males in the highest combined risk-taking index had a 1.9 times greater risk of training-related injury compared to those within one standard deviation of the mean combined risk-taking index (HR: 1.9, 95%CI: 1.6, 2.3) after adjusting for aerobic fitness, age, race, education, and cigarette use. Additionally, males with the lowest combined risk-taking scores had 1.7 times greater risk of training-related injury compared to those within average risk-taking scores (HR: 1.7, 95%CI: 1.5, 2.0). Cigarette use was independently associated with training-related injury risk as well; males in the medium risk category of cigarette use were at 1.8 times greater risk of training-related injury compared to males in the low risk cigarette use category (HR: 1.8, 95%CI: 1.3, 2.4). The hazard ratio for males in the high risk cigarette use category was elevated, but not statistically significant (HR: 1.4, 95%CI: 0.9, 2.4).

All other individual health risk behavior indices (that is, smokeless tobacco use, alcohol use, diet/lifestyle choices, and weight control practices) were not associated with injury risk in the adjusted models. Other health risk behavior variables that were not included in a risk index (age at first sexual intercourse, condom use, and number of tickets for moving violations) were also evaluated for association with training-related injury while adjusting for social and physiologic covariates. None of these health risk behaviors were retained in a multivariate model.

Table 39. Cox Regression Models Testing the Association of the Combined Risk-Taking Index with Training-Related Injury–Males

| Variable | Categories | Hazard Ratio (95% confidence interval) |
|---|---------------------------------------|---|
| Model 1: Unadjusted | | |
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 1.30 (0.96, 1.78) |
| | High risk-taking (1-2SD above mean) | 1.43 (0.65, 3.15) |
| | Highest risk-taking (>2SD above mean) | 2.04 (1.29, 3.24) |
| Model 2: Full Model with All Social Covariates | | |
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 1.44 (1.12, 1.83) |
| | High risk-taking (1-2SD above mean) | 1.37 (0.67, 2.81) |
| | Highest risk-taking (>2SD above mean) | 2.07 (1.24, 3.44) |
| Race/ethnicity | White | ref |
| | Black | 1.12 (0.88, 1.64) |
| | Hispanic | 0.65 (0.52, 0.83) |
| Education level | Some college or more | ref |
| | GED | 1.74 (1.66, 1.82) |
| | HS graduate | 1.13 (0.73, 1.75) |
| | No HS diploma or still in HS | 1.60 (0.95, 2.69) |
| Component | Regular Army | ref |
| | Army Reserve or National Guard | 0.86 (0.72, 1.02) |
| Marital status | Single | ref |
| | Married or other | 1.07 (0.61, 1.90) |

Table 39. Cox Regression Models Testing the Association of the Combined Risk-Taking Index with any Training-Related Injury–Males (continued)

| Model 3: Full Model with All Physiologic Covariates and Statistically Significant Social Covariates from Model 2 | | |
|--|--|---|
| Variable | Categories | Hazard Ratio (95% confidence interval) |
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 1.40 (0.93, 2.11) |
| | High risk-taking (1-2SD above mean) | 1.38 (0.70, 2.73) |
| | Highest risk-taking (>2SD above mean) | 2.08 (1.48, 2.92) |
| Race/ethnicity | White | ref |
| | Black | 1.28 (0.96, 1.69) |
| | Hispanic | 0.67 (0.50, 0.89) |
| Education level | Some college or more | ref |
| | GED | 1.73 (1.41, 2.13) |
| | HS graduate | 1.19 (0.77, 1.86) |
| | No HS diploma or still in HS | 1.52 (0.95, 2.44) |
| Runtime on initial APFT | continuous | 1.14 (1.03, 1.27) |
| Pushups on initial APFT | continuous | 0.99 (0.98, 1.00) |
| Situps on initial APFT | continuous | 0.99 (0.96, 1.02) |
| Age | 17-21 years old | ref |
| | 22-37 years old | 1.03 (0.85, 1.26) |
| Vigorous activity prior to basic training | 4+ times/week | ref |
| | 1-3 times/week | 0.88 (0.58, 1.33) |
| | never | 1.02 (0.70, 1.49) |
| BMI | normal | ref |
| | underweight | 1.17 (0.45, 3.04) |
| | overweight or obese | 0.94 (0.76, 1.15) |

Table 40. Final Cox Regression Model for Males, Combined Risk-Taking Index Only

| Variable | Categories | Hazard Ratio (95% confidence interval) |
|----------------------------|---------------------------------------|---|
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 1.51 (1.12, 2.03) |
| | High risk-taking (1-2SD above mean) | 1.40 (0.68, 2.87) |
| | Highest risk-taking (>2SD above mean) | 2.37 (1.57, 3.59) |
| Education level | Some college or more | ref |
| | GED | 1.71 (1.51, 1.93) |
| | HS graduate | 1.16 (0.85, 1.57) |
| | No HS diploma or still in HS | 1.50 (1.09, 2.06) |
| Age 17-21 | Whites | ref |
| | Blacks | 1.28 (1.12, 1.46) |
| | Hispanics | 0.43 (0.22, 0.81) |
| Age 22-37 | Whites | 0.96 (0.66, 1.38) |
| | Blacks | 1.00 (0.45, 2.23) |
| | Hispanics | 1.26 (0.79, 2.02) |
| Runtime on initial APFT | continuous | 1.17 (1.09, 1.25) |

Table 41. Final Cox Regression Model for Males, Combined Risk-Taking and Cigarette Use Indices

| Variable | Categories | Hazard Ratio (95% confidence interval) |
|----------------------------|---------------------------------------|---|
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 1.73 (1.47, 2.05) |
| | High risk-taking (1-2SD above mean) | 1.16 (0.79, 1.70) |
| | Highest risk-taking (>2SD above mean) | 1.92 (1.57, 2.34) |
| Cigarette use index | Low risk | ref |
| | Medium risk | 1.77 (1.31, 2.40) |
| | High risk | 1.43 (0.80, 2.40) |
| Education level | Some college or more | ref |
| | GED | 1.60 (1.28, 1.99) |
| | HS graduate | 1.14 (0.86, 1.50) |
| | No HS diploma or still in HS | 1.50 (1.13, 1.98) |
| Runtime on initial APFT | continuous | 1.17 (1.08, 1.26) |
| Age 17-21 | Whites | ref |
| | Blacks | 1.35 (1.21, 1.50) |
| | Hispanics | 0.43 (0.21, 0.88) |
| Age 22-37 | Whites | 0.96 (0.70, 1.31) |
| | Blacks | 1.05 (0.46, 2.40) |
| | Hispanics | 1.26 (0.81, 1.97) |

(2) Other Training-Related Injury Types–Males.

The model developed for any training-related injury was next used to test the associations of the combined risk-taking index with overuse training-related injury, traumatic training-related injury, and training-related injuries with work limitations among males (Tables 42-44). In the overuse injury model (Table 42), only those males with the lowest combined risk-taking scores were at greater risk of injury compared to males with “average” risk-taking scores (HR: 1.7, 95%CI: 1.3, 2.0). In addition, males in the medium risk cigarette use category had a statistically significant higher hazard compared to males in the low risk cigarette use category (HR: 1.9, 95%CI: 1.3, 3.0).

For traumatic training-related injuries (Table 43), all levels of the combined risk-taking index were associated with training-related injury. Compared to males with average combined risk-taking scores, those with the lowest risk-taking scores had twice the risk of traumatic injury (HR: 2.2, 95%CI: 1.3, 3.7), those with slightly elevated risk scores had 1.6 times the risk of traumatic

injury (HR: 1.6, 95%CI: 1.5, 1.7), and those with the highest risk-taking scores had 1.7 times the risk of traumatic injury (HR: 1.7, 95%CI: 1.2, 2.3). Additionally, males in the high risk category of cigarette use had twice the risk of traumatic injury compared to their peers in the low risk category (HR: 2.2, 95%CI: 1.4, 3.6).

Results for training-related injuries with work limitations (Table 44) were similar to results reported for any training-related injury (Table 41). Both the males with the lowest combined risk-taking scores and the highest combined risk-taking scores had statistically significant greater risk of injury compared to males of “average” risk-taking tendency (HR: 2.0, 95%CI: 1.6, 2.6 and HR: 2.0, 95%CI: 1.5, 2.5, lowest and highest combined risk-taking categories, respectively). As seen in models for any training-related injury and overuse training-related injury, males in the medium risk cigarette use category had an elevated hazard of injury resulting in work limitations (HR: 1.9, 95%CI: 1.4, 2.5).

Table 42. Final Cox Regression Model for Males, Overuse Training-Related Injury

| Variable | Categories | Hazard Ratio (95% confidence interval) |
|----------------------------|---------------------------------------|---|
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 1.66 (1.34, 2.05) |
| | High risk-taking (1-2SD above mean) | 1.07 (0.48, 2.39) |
| | Highest risk-taking (>2SD above mean) | 1.40 (0.72, 2.73) |
| Cigarette use index | Low risk | ref |
| | Medium risk | 1.94 (1.27, 2.97) |
| | High risk | 1.16 (0.67, 2.00) |
| Education level | Some college or more | ref |
| | GED | 2.10 (1.63, 2.70) |
| | HS graduate | 1.30 (0.97, 1.75) |
| | No HS diploma or still in HS | 1.39 (1.20, 1.62) |
| Runtime on initial APFT | continuous | 1.14 (1.07, 1.23) |
| Age 17-21 | Whites | ref |
| | Blacks | 1.46 (0.98, 2.18) |
| | Hispanics | 0.45 (0.16, 1.31) |
| Age 22-37 | Whites | 1.32 (0.84, 2.07) |
| | Blacks | 1.37 (0.59, 3.17) |
| | Hispanics | 1.29 (0.68, 2.47) |

Table 43. Final Cox Regression Model for Males, Traumatic Training-Related Injury

| Variable | Categories | Hazard Ratio (95% confidence interval) |
|----------------------------|---------------------------------------|---|
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 2.16 (1.25, 3.73) |
| | High risk-taking (1-2SD above mean) | 1.58 (1.46, 1.71) |
| | Highest risk-taking (>2SD above mean) | 1.65 (1.18, 2.31) |
| Cigarette use index | Low risk | ref |
| | Medium risk | 1.27 (0.65, 2.47) |
| | High risk | 2.22 (1.38, 3.56) |
| Education level | Some college or more | ref |
| | GED | 1.22 (0.39, 3.79) |
| | HS graduate | 1.42 (0.69, 2.91) |
| | No HS diploma or still in HS | 2.69 (1.13, 5.36) |
| Runtime on initial APFT | continuous | 1.09 (1.08, 1.11) |
| Age 17-21 | Whites | ref |
| | Blacks | 1.39 (0.74, 2.65) |
| | Hispanics | 0.57 (0.24, 1.35) |
| Age 22-37 | Whites | 0.61 (0.43, 0.86) |
| | Blacks | 0.47 (0.15, 1.48) |
| | Hispanics | 1.71 (0.99, 2.94) |

Table 44. Final Cox Regression Model for Males, Training-Related Injury with Work Limitations

| Variable | Categories | Hazard Ratio (95% confidence interval) |
|----------------------------|---------------------------------------|---|
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 2.02 (1.57, 2.59) |
| | High risk-taking (1-2SD above mean) | 1.09 (0.70, 1.71) |
| | Highest risk-taking (>2SD above mean) | 1.95 (1.53, 2.47) |
| Cigarette use index | Low risk | ref |
| | Medium risk | 1.90 (1.42, 2.53) |
| | High risk | 1.41 (0.78, 2.55) |
| Education level | Some college or more | ref |
| | GED | 1.65 (1.14, 2.39) |
| | HS graduate | 1.11 (0.88, 1.40) |
| | No HS diploma or still in HS | 1.25 (1.96, 1.62) |
| Runtime on initial APFT | Continuous | 1.17 (1.10, 1.25) |
| Age 17-21 | Whites | ref |
| | Blacks | 1.52 (1.33, 1.74) |
| | Hispanics | 0.44 (0.22, 0.86) |
| Age 22-37 | Whites | 1.06 (0.88, 1.29) |
| | Blacks | 0.93 (0.44, 1.95) |
| | Hispanics | 1.30 (1.09, 1.56) |

(3) Any Training-Related Injury–Females.

Results of the modeling steps used to test the association of any training-related injury among females with the combined risk-taking index and individual risk indices are shown in Tables 45-47. In the unadjusted (univariate) model (Table 45, Model 1) the combined risk-taking score was not associated with training-related injury. In the second model, to which social covariates had been added, only component (Regular Army or Reserves/National Guard) was statistically significantly associated with training-related injury (Table 45, Model 2). Education, specifically the variable representing trainees with a GED, exited the backward stepwise regression model at $p < 0.100$.

In the third modeling step, physiologic covariates were added. The following variables displayed statistically significant associations with training-related injury: run time on the initial APFT, sit-up performance on the initial APFT, component, and age (Table 45, Model 3). An interaction between BMI and age was found; tables that follow show results by age and BMI group.

Based on the results of the previous modeling steps, the social and physiologic covariates considered for inclusion in the final models were as follows: run time on the initial APFT, sit-up performance on the initial APFT, BMI, age, and the interaction between BMI and age. The hazard ratios and 95% confidence intervals of all covariates are shown in Table 46. The combined risk-taking index was not a predictor of training-related injury in this multivariate model.

The next step of the modeling process (Table 47), the inclusion of individual health risk behavior indices in the model, revealed that both the cigarette use and diet/lifestyle indices were associated with risk of training-related injury among females, while adjusting for the combined risk-taking index and social and physiologic covariates. Females in the high risk cigarette use category had an approximately 50% greater risk of injury compared to females in the low risk category (HR: 1.5, 95%CI: 1.1, 2.1). Females in the high risk diet/lifestyle index category also had an approximately 50% greater injury hazard compared to females in the low risk category (HR: 1.5, 95%CI: 1.2, 1.9). Alcohol use and weight control practices indices were not associated with training-related injury. No other health risk behavior variables (age at first sexual intercourse, condom use, number of tickets for moving violations) were associated with training-related injury in a multivariate model.

Table 45. Cox Regression Models Testing the Association of the Combined Risk-Taking Index with Any Training-Related Injury–Females

| Variable | Categories | Hazard Ratio (95% confidence interval) |
|---|---------------------------------------|---|
| Model 1: Unadjusted | | |
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 0.82 (0.66, 1.02) |
| | High risk-taking (1-2SD above mean) | 1.06 (0.85, 1.33) |
| | Highest risk-taking (>2SD above mean) | 0.93 (0.39, 2.22) |
| Model 2: Full Model with All Social Covariates | | |
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 0.90 (0.68, 1.20) |
| | High risk-taking (1-2SD above mean) | 0.86 (0.62, 1.18) |
| | Highest risk-taking (>2SD above mean) | 0.88 (0.33, 2.34) |
| Race/ethnicity | White | ref |
| | Black | 0.98 (0.33, 1.29) |
| | Hispanic | 0.96 (0.75, 1.45) |
| Education level | Some college or more | ref |
| | GED | 1.80 (0.82, 3.93) |
| | HS graduate | 1.24 (0.63, 2.43) |
| | No HS diploma or still in HS | 1.15 (0.46, 2.87) |
| Component | Regular Army | ref |
| | Army Reserve or National Guard | 0.86 (0.75, 0.99) |
| Marital status | Single | ref |
| | Married or other | 1.28 (0.76, 2.15) |

Table 45. Cox Regression Models Testing the Association of the Combined Risk-Taking Index with any Training-Related Injury—Females (continued)

| Variable | Categories | Hazard Ratio (95% confidence interval) |
|--|---------------------------------------|---|
| Model 3: Full Model with all Physiologic Covariates and Statistically Significant Social Covariates From Model 2 | | |
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 0.90 (0.72, 1.13) |
| | High risk-taking (1-2SD above mean) | 0.99 (0.92, 1.06) |
| | Highest risk-taking (>2SD above mean) | 0.85 (0.26, 2.84) |
| Component | Regular Army | ref |
| | Reserves or National Guard | 0.88 (0.77, 0.99) |
| Runtime on initial APFT | continuous | 1.11 (1.03, 1.19) |
| Pushups on initial APFT | continuous | 0.99 (0.97, 1.02) |
| Situps on initial APFT | continuous | 0.98 (0.97, 0.99) |
| Age | 17-21 years | ref |
| | 22-35 years | 1.15 (1.06, 1.26) |
| Vigorous exercise prior to basic training | 4+ times/week | ref |
| | 1-3 times/week | 1.00 (0.86, 1.16) |
| | never | 1.13 (0.96, 1.32) |
| BMI | normal | ref |
| | underweight | 1.50 (0.86, 2.60) |
| | overweight or obese | 0.88 (0.73, 1.07) |

Table 46. Final Cox Regression Model for Females, Combined Risk-Taking Index Only

| Variable | Categories | Hazard Ratio (95% confidence interval) |
|----------------------------|---------------------------------------|---|
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 0.90 (0.69, 1.16) |
| | High risk-taking (1-2SD above mean) | 0.98 (0.87, 1.11) |
| | Highest risk-taking (>2SD above mean) | 0.88 (0.31, 2.52) |
| Run time on initial APFT | continuous | 1.12 (1.06, 1.19) |
| Sit-ups on initial APFT | continuous | 0.98 (0.97, 0.98) |
| Age 17-21 | Normal BMI | ref |
| | Underweight | 1.27 (0.82, 1.98) |
| | Overweight or obese | 0.98 (0.69, 1.41) |
| Age 22-35 | Normal BMI | 1.19 (0.97, 1.47) |
| | Underweight | 2.86 (1.10, 7.42) |
| | Overweight or obese | 0.97 (0.88, 1.07) |

Table 47. Final Cox Regression Model for Females, Including Combined Risk-Taking, Cigarette Use, and Diet/Lifestyle Indices

| Variable | Categories | Hazard Ratio (95% confidence interval) |
|------------------------------|---------------------------------------|---|
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 1.08 (0.91, 1.29) |
| | High risk-taking (1-2SD above mean) | 0.76 (0.57, 0.99) |
| | Highest risk-taking (>2SD above mean) | 0.68 (0.29, 1.60) |
| Cigarette use index | Low risk | ref |
| | Medium risk | 1.43 (0.96, 2.15) |
| | High risk | 1.53 (1.10, 2.12) |
| Diet/lifestyle choices index | Low risk | ref |
| | Medium risk | 1.08 (1.03, 1.14) |
| | High risk | 1.52 (1.21, 1.93) |
| Run time on initial APFT | continuous | 1.12 (1.05, 1.20) |
| Sit-ups on initial APFT | continuous | 0.98 (0.97, 0.98) |
| Age 17-21 | Normal BMI | ref |
| | Underweight | 1.17 (0.66, 2.07) |
| | Overweight or obese | 0.99 (0.68, 1.44) |
| Age 22-35 | Normal BMI | 1.20 (1.04, 1.39) |
| | Underweight | 2.71 (0.98, 7.45) |
| | Overweight or obese | 0.93 (0.80, 1.09) |

(4) Other Training-Related Injury Types–Females.

The model developed for any training-related injury was next used to test the associations of the combined risk-taking index with overuse training-related injury, traumatic training-related injury, and training-related injuries with work limitations among females (Tables 48-50). The combined risk-taking index was not associated with any of these injury types for females. However, in the overuse injury model (Table 48), females in the medium and high risk cigarette use index categories had a statistically significant higher hazard ratio compared to females in the low risk cigarette use category (HR: 1.6, 95%CI: 1.3, 2.0 and HR: 1.2, 95%CI: 1.1, 1.4, medium and high risk cigarette use categories respectively). Females in the high risk diet/lifestyle index category had a statistically significant higher hazard ratio compared to females in the low risk category (HR: 1.5, 95%CI: 1.3, 1.7).

For traumatic training-related injuries (Table 49), the only statistically significant association was seen with cigarette use. Females in the high risk category of cigarette use had twice the risk of traumatic injury compared to females in the low risk category (HR: 2.0, 95%CI: 1.1, 3.6).

As seen with all previous injury types, females in the high risk cigarette use category had a higher risk of sustaining a training-related injury requiring work limitations (Table 50) compared to females in the low risk category (HR: 1.6, 95%CI: 1.2, 2.2). In addition, females in the medium risk cigarette use category had an approximately 50% higher hazard of injury compared to those in the low risk category (HR: 1.5, 95%CI: 1.0, 2.3). In addition, females with the highest diet/lifestyle risk scores had an elevated risk of injury resulting in work limitations compared to females in the lowest risk category (HR: 1.3, 95%CI: 1.1, 1.2) while controlling for statistically significant social and physiologic covariates.

Table 48. Final Cox Regression Model for Females, Overuse Training-Related Injury

| Variable | Categories | Hazard Ratio (95% confidence interval) |
|------------------------------|---------------------------------------|---|
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 1.20 (0.75, 1.93) |
| | High risk-taking (1-2SD above mean) | 0.87 (0.62, 1.21) |
| | Highest risk-taking (>2SD above mean) | 0.61 (0.15, 2.51) |
| Cigarette use index | Low risk | ref |
| | Medium risk | 1.58 (1.29, 1.95) |
| | High risk | 1.22 (1.11, 1.35) |
| Diet/lifestyle choices index | Low risk | ref |
| | Medium risk | 1.15 (0.85, 1.56) |
| | High risk | 1.46 (1.27, 1.68) |
| Run time on initial APFT | continuous | 1.15 (1.09, 1.21) |
| Sit-ups on initial APFT | continuous | 0.98 (0.97, 0.99) |
| Age 17-21 | Normal BMI | ref |
| | Underweight | 1.64 (0.90, 2.99) |
| | Overweight or obese | 1.04 (0.87, 1.24) |
| Age 22-35 | Normal BMI | 1.15 (1.12, 1.18) |
| | Underweight | 3.58 (1.49, 8.61) |
| | Overweight or obese | 0.90 (0.66, 1.23) |

Table 49. Final Cox Regression Model for Females, Traumatic Training-Related Injury

| Variable | Categories | Hazard Ratio (95% confidence interval) |
|------------------------------|---------------------------------------|---|
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 1.24 (0.59, 2.63) |
| | High risk-taking (1-2SD above mean) | 0.73 (0.41, 1.31) |
| | Highest risk-taking (>2SD above mean) | 0.88 (0.63, 1.21) |
| Cigarette use index | Low risk | ref |
| | Medium risk | 1.13 (0.72, 1.80) |
| | High risk | 2.00 (1.10, 3.63) |
| Diet/lifestyle choices index | Low risk | ref |
| | Medium risk | 0.95 (0.71, 1.27) |
| | High risk | 1.48 (0.63, 3.47) |
| Run time on initial APFT | continuous | 1.11 (0.99, 1.23) |
| Sit-ups on initial APFT | continuous | 0.98 (0.97, 1.00) |
| Age 17-21 | Normal BMI | ref |
| | Underweight | 0.79 (0.55, 1.14) |
| | Overweight or obese | 0.91 (0.30, 2.77) |
| Age 22-35 | Normal BMI | 1.27 (0.82, 1.98) |
| | Underweight | 1.41 (0.92, 2.18) |
| | Overweight or obese | 1.28 (0.81, 2.02) |

Table 50. Final Cox Regression Model for Females, Training-Related Injury with Work Limitations

| Variable | Categories | Hazard Ratio (95% confidence interval) |
|------------------------------|---------------------------------------|---|
| Combined risk-taking index | Average risk-taking (1SD around mean) | ref |
| | Low risk-taking (>1SD below mean) | 1.19 (0.88, 1.64) |
| | High risk-taking (1-2SD above mean) | 0.75 (0.53, 1.07) |
| | Highest risk-taking (>2SD above mean) | 0.53 (0.13, 2.06) |
| Cigarette use index | Low risk | ref |
| | Medium risk | 1.52 (1.02, 2.28) |
| | High risk | 1.64 (1.21, 2.22) |
| Diet/lifestyle choices index | Low risk | ref |
| | Medium risk | 1.08 (0.98, 1.18) |
| | High risk | 1.34 (1.10, 1.63) |
| Run time on initial APFT | continuous | 1.13 (1.07, 1.20) |
| Sit-ups on initial APFT | continuous | 0.98 (0.97, 0.98) |
| Age 17-21 | Normal BMI | ref |
| | Underweight | 1.17 (0.62, 2.21) |
| | Overweight or obese | 1.07 (0.83, 1.36) |
| Age 22-35 | Normal BMI | 1.28 (1.17, 1.39) |
| | Underweight | 2.87 (1.12, 7.36) |
| | Overweight or obese | 0.96 (0.71, 1.29) |

9. DISCUSSION.

As with previous studies of training-related injuries in U.S. Army basic training, this sample consisted of a substantial proportion of female trainees (39.2%), enabling the analysis of injury risk factors by gender. Analysis of RAP questionnaire responses allowed for an unusually detailed understanding of the sample. For example, most trainees reported entering the Army for practical purposes, that is, to gain an education and job skills. Most believed their health was very good or excellent, and a large number of males had not seen a health care provider in the past 5 years. Emotional and mental health indicators reported by these trainees suggested that, while most seemed to have adequate social support systems, notable proportions had experienced negative life events (such as, parental divorce, death of a loved one in the past year) and adverse childhood experiences (such as, emotional abuse, sexual abuse, living with a problem drinker, and living with a depressed or mentally ill person). The proportions of trainees who experienced traumatic life events was also notable; 20% had seen a close family member or friend badly injured or killed, 26% had been threatened with a weapon, and 17% of women reported they had been raped.

The RAP survey also provided substantial insight into health risk behaviors. Approximately 40% of the trainees had smoked regularly during their lifetime, but 56% had not smoked in the year prior to basic training. Males tended to smoke a greater quantity of cigarettes when smoking regularly and a greater proportion of males than females reported smokeless tobacco and cigar use, as has also been reported in other populations (Grunbaum, Kann et al. 2002; Substance Abuse and Mental Health Services Administration (SAMHSA) 2004).

Lifetime and current cigarette use did not differ significantly by gender, a result contrary to what has been reported for general U.S. population samples with similar age distributions. U.S. surveys have reported lifetime and current use to be higher among adolescent males (Grunbaum, Kann et al. 2002; Substance Abuse and Mental Health Services Administration (SAMHSA) 2004). While it is known that reported substance use increases with age (Duberstein Lindberg, Boggess et al. 2000; Substance Abuse and Mental Health Services Administration (SAMHSA) 2004), females in this sample were not older than male trainees. Additionally, existing survey results indicated that black female students were less likely to report cigarette use compared to whites and Hispanics (Grunbaum, Kann et al. 2002). With a female population that was 25.5% black, the proportion of female cigarette users was expected to be lower than national survey results. Other samples of RAP survey participants reported difficulty understanding the wording of the smoking questions (Canham-Chervak, Hauret et al. 2003), therefore misclassification bias may have contributed to these results. Further exploration is warranted.

Males in this sample reported more high risk alcohol-related behaviors, as indicated by the statistically significant greater proportions of males reporting hazardous drinking behaviors (AUDIT-C score ≥ 5) and behaviors related to alcohol abuse and dependence (CAGE score ≥ 1). This result mirrors the civilian youth population, in which 21% of males age 18-25 reported heavy alcohol use in the past thirty days, compared to 9% of females (Substance Abuse and Mental Health Services Administration (SAMHSA) 2004). Additionally, as seen in YRBS data (Grunbaum, Kann et al. 2002), males were more likely to report initiation of alcohol use at a younger age.

The higher proportion of males compared to females who reported drinking and driving, never wearing a seat belt, and having two or more tickets for moving violations indicated that males in this sample tended to take more risks that could result in physical injury. This is true in samples of the U.S. youth population as well; YRBS data has shown that 17.2% of males compared to 9.5% of females reported ever drinking and driving, and 18.1% of males compared to 10.2% of females reported never or rarely wearing a seat belt (Grunbaum, Kann et al. 2002).

For two out of three diet-related health risk behaviors, consumption of fast food and caffeinated beverages, males reported greater frequency of these behaviors. The National Heart, Lung, and Blood Institute recommends no more than two fast food meals a week (Pereira, Kartashov et al. 2005); 28.1% of males in this sample had four or more fast food meals a week and 67% had two or more fast food meals a week, compared with 23.5% and 61.9%, respectively, among females. In addition to its association with long-term health effects (Knight, Knight et al. 2004; McGee 2005), excessive caffeine use can lead to insomnia, sleep disruption, and subsequent daytime sleepiness (Millman and AAP Committee on Adolescence 2005), problems that are especially persistent in young adult populations and are associated with negative outcomes (such as, poor school performance, motor vehicle accidents due to falling asleep at the wheel) resulting from poor cognitive functioning. Thirty percent of males in this sample reported drinking four or more caffeinated beverages a day, compared to 25% of females. In general, these measures represent a tendency to, knowingly or unknowingly, take health risks that could result in health and life-compromising outcomes.

Despite a greater frequency of most health risk behaviors, males were more physically fit than females in the sample. Male trainees had higher APFT scores and reported greater frequency of prior vigorous activity compared to their female peers. Higher fitness likely contributed to their lower training-related injury rates.

a. Health Risk Behaviors in the Study Sample vs. U.S. Population.

In many cases, direct comparisons of the prevalence of health risk behaviors in the Army basic training population with results from national youth health risk behavior surveys were impossible due to differences in survey question wording or data grouping and reporting. For example, questions about smokeless tobacco use and alcohol use on national surveys ask about use during the past month, while the RAP survey asks about use during the past year (thus resulting in higher reported prevalence). Further complicating comparisons, the proportions shown were not gender or race-adjusted. However, these comparisons provided an indication of how 17-20 year olds in this sample of Army basic trainees compared to samples of similar age groups from the general U.S. population. In many instances, the proportions of health risk behaviors reported among Army trainees fell between proportions reported in national surveys. Such results are reasonable, given that the median age of the sample population fell between the age groups sampled in the national survey results presented.

Acknowledging the imperfections of these comparisons, it appears that the prevalence of lifetime and current cigarette use, lifetime and current alcohol use, sports team participation, TV viewing, sexual health risk behaviors, traffic violations, and seat belt use in the study sample are comparable to the prevalence of these health risk behaviors in samples of U.S. youth.

Differences were most apparent among the following behaviors: age of initiation of cigarette use and alcohol use, vigorous activity levels, drinking and driving, and steroid use.

The higher proportion of youth reporting cigarette use prior to age 13 in the U.S. sample (22.1% vs. 14.7% in the Army RAP sample) may be attributable to the higher proportion of blacks in the Army population. Even with over-sampling of black populations, only 13.0% of the 2001 Youth Risk Behavior Surveillance data was gathered from black students, while almost 18% of this basic training population sample were black. YRBS data have shown that black students were significantly less likely to have smoked a whole cigarette by age 13 (Grunbaum, Kann et al. 2002). Black youth were also less likely to report current tobacco and alcohol use compared to whites and Hispanics (Grunbaum, Kann et al. 2002). The higher proportion of blacks in the Army sample may also partially explain the lower proportion reporting their first alcoholic drink at age 13 or younger (21.7%) compared to the proportion of U.S. youth reporting their first alcoholic drink before age 13 (29.1%).

Lower vigorous activity levels among persons entering basic training compared to YRBS survey participants (54.6% vs. 64.6%, respectively) could be explained by the fact that many trainees who already graduated from HS no longer benefited from routine physical activity as is often mandated by school systems or encouraged through availability of organized sports activities. According to the YRBS, one third of students in grades 9 through 12 participated in physical education classes daily (Grunbaum, Kann et al. 2002). Data from the present study also indicate that the GED group contained the highest proportion of trainees who “never exercised vigorously” prior to basic training as compared to all other educational groups ($p < 0.001$).

Given that the Army sample contains a higher proportion of males (60.8%) compared to national samples (48.7% and 47.3%, YRBS and SAMHSA surveys respectively), it was surprising that the prevalence of certain health risk behaviors, such as alcohol and smokeless tobacco use, were not higher. National surveys have indicated that such behaviors are higher among males compared to females (Grunbaum, Kann et al. 2002; Vega, Aguilar-Gaxiola et al. 2002).

b. Co-occurrence of Health Risk Behaviors.

Concerning the co-occurrence of health risk behaviors, correlations of individual health risk behavior indices among males indicated that trainees with a high cigarette use index score also had high scores related to smokeless tobacco use and alcohol use. Among females, most of whom did not use smokeless tobacco, cigarette use and alcohol use had the highest positive correlations of all health risk behaviors examined. In an analysis of three national youth surveys, this result was also seen; co-occurrence was greatest among measures of substance use (Duberstein Lindberg, Boggess et al. 2000). Co-occurrence of substance use behaviors in this sample was confirmed by data that showed sizable proportions of males and females in the highest combined risk-taking category were also in the highest cigarette, smokeless tobacco (males only), and alcohol use categories. Correlations among the other health risk behaviors measured by indices (diet/lifestyle choices, weight control practices) were statistically significant, but not as strong, indicating that these health risk behaviors were less likely to co-occur.

c. Association of Health Risk Behaviors and Training-Related Injury Risk.

For males in this sample, multivariate analyses controlling for statistically significant social and physiologic covariates showed that males with combined risk-taking index scores at the extremes (lowest, highest) had a greater risk of any type of training-related injury. Among females, this relationship was not observed. When the multivariate model for any training-related injury was applied to other, more specific, injury outcomes, the combined risk-taking index was associated with overuse, traumatic, and injuries resulting in work limitations in different ways. Males in both categories above the “average” combined risk-taking level for this sample (within one standard deviation of mean male combined risk-taking score) were at greater risk of traumatic injury. Given that risk-taking behaviors have previously been linked to traumatic injury (Cohen and Lin 1991; Bell, Amoroso et al. 2000; Williams, Bell et al. 2002), this result is not surprising. Unexpectedly, however, risk of any training-related injury (overuse, traumatic, or injury with work limitations) among males was higher in the lowest risk-taking category as well. This result suggests that males who are less willing to take risks are at an increased risk of injury in the Army basic training environment. In this environment, in which numerous strenuous physical and mental tasks are required, a certain level of risk-taking may be advantageous.

Among females, the relationship between the combined risk-taking index and injury was different; females in the high risk-taking category had a lower risk of any training-related injury compared to females with an “average” risk-taking tendency. For females, a slightly higher risk-taking tendency provided some protection from training-related injury. These results suggest that risk-taking and its link with training-related injury differs for males and females.

As has been seen in other studies of Army populations (Friedl, Nuovo et al. 1992; Jones, Cowan et al. 1993; Knapik, Reynolds et al. 1997; Knapik, Sharp et al. 1999; Lincoln, Smith et al. 2002), among both males and females, cigarette use was associated with injury, both overuse and traumatic. Among males, any smoking (that is, both medium and high risk cigarette use) was associated with training-related injury, although the strongest associations were seen for male trainees who smoked a half pack or less a day, smoked for 1 year or less, and started smoking at an older age (that is, medium risk cigarette users). Among females, the association was as expected; those who smoked more than one pack a day, smoked for more than a year, and initiated smoking at an early age (that is, high risk cigarette users) had a statistically significant higher injury risk compared to non-smokers (that is, low risk cigarette users).

The association between cigarette smoking and overuse injuries may be related to the adverse physiologic effects of nicotine that delay wound healing (White, Pedersen et al. 1988; Amoroso, Reynolds et al. 1996; Knapik, Canham-Chervak et al. 1999), although longer-term effects such as lower bone density among female smokers (Amoroso, Reynolds et al. 1996; Centers for Disease Control and Prevention 2002) and connective tissue atrophy may also play a role (Amoroso, Reynolds et al. 1996).

The link between cigarette use and traumatic injury is less clear, but the adverse effects of nicotine withdrawal (such as, difficulty concentrating and depression) may impair judgment enough to lead to behaviors, such as stepping into a pothole while running or inappropriately negotiating an obstacle, that could result in an acute injury. Additionally, the higher mean

combined risk-taking index scores among medium and high risk cigarette use index categories (Table 29) suggests that, in general, cigarette users tend to take more health risks. Persons who risk health by smoking, drinking and driving, not wearing a seatbelt, or vomiting to control weight may also be more likely to make choices that increase their risk of traumatic training-related injury.

Among females, this tendency to take health risks may have also been captured by the diet/lifestyle index, which was associated with any training-related injury, overuse training-related injury, and training-related injury with work limitations. This index captured a tendency towards risk-taking that the combined risk-taking index, developed for both genders, did not capture for females. Whether they take these risks knowingly or unknowingly is not known, but problem-behavior theory would suggest that diet and lifestyle choices reflect “adherence to the norms of conventional society”, the value an individual places on health, if they believe health can be influenced by daily choices (internal health locus of control), and if their social support systems enhance or detract from routine healthy decision-making (Jessor, Turbin et al. 1998). As stated above, such tendencies towards riskier health decisions may translate into choices that increase their risk of training-related injury as well.

Finally, there were two interactions of interest in the multivariate models. Among males, the effect of age differed by race/ethnicity. More specifically, younger Hispanic males had a lower risk of injury compared to younger white males. While a lower risk of injury among Hispanics compared to whites has been observed in other Army basic training populations (Jones, Cowan et al. 1993; Knapik, Sharp et al. 1999), risk has not been specified according to age. The lower risk of injury among younger male Hispanics may be partially explained by their fitness; compared to young white males, they were more likely to report exercising vigorously four or more times per week (47.0% vs. 37.2%, Hispanics vs. whites; $p=0.07$) and had higher aerobic fitness upon entry to basic training as measured by performance on the run event of the initial APFT ($p=0.034$).

Among females, an interaction between age and BMI was found. In the older age group (22-35 years old), female trainees with a normal BMI ($BMI=18.5-24.9$) or those who were underweight ($BMI<18.5$) were had an increased injury risk. While overweight and obese BMI measures have been more commonly associated with increased injury risk, underweight females have been at higher risk of injury compared to those with a normal BMI in other injury studies (Benson, Geiger et al. 1989; Macera, Jackson et al. 1989), including investigations of injuries among Army basic trainees (Jones, Cowan et al. 1993; Mansfield, Knapik et al. 2001).

10. LIMITATIONS.

Limitations of this study include its focus on one occupational group, thereby potentially limiting the generalizability of the results to the general U.S. young adult population. In fact, when compared to 20-24 year olds in the general U.S. population, the study sample had a greater percentage of males, blacks, and fewer persons with a college education. Given these differences, generalizations of results to the U.S. young adult population should be made with caution.

While the sample was comparable to previous basic training populations with regard to age, gender, and marital status, differences in distributions of race and education were found. Specifically, this sample contained a lower proportion of blacks than previous samples of U.S. Army basic trainees, most likely because of the lower RAP participation rate among blacks. Reasons for lower participation among blacks is unclear; however analysis of anonymous evaluations of the RAP survey indicated that many non-participants were skeptical of the potential harms (such as, self-incrimination, loss of insurability, threats to employability) communicated as part of the informed consent briefing (Canham-Chervak, Hauret et al. 2003).

The current study also had a higher proportion of trainees who had not completed HS than has been typically seen in previous samples of U.S. Army basic trainees. This was due to regulations during this time period that allowed HS juniors who enlisted in the Army to complete the basic training requirement during the summer between their junior and senior years of HS rather than waiting until after HS graduation (that is, the “split option”).

Another limitation of this study is the reliance on self-reported health risk behavior data. As with other large-scale surveys such as the Youth Risk Behavior Survey (Warren, 1997), the validity of responses to the RAP survey has not been established. Inaccurate or dishonest responses could have resulted in inappropriate risk assignments (misclassification bias). Given that many RAP questions asked about health risk behaviors “in the past year”, recall bias was also possible. In addition, despite assurances that RAP questionnaire responses would not be shared with superiors or reported in a way that individuals could be identified, newly-enlisted trainees may not have been honest in their reporting of behaviors, due to fears of adverse consequences. This is especially true with regard to certain behaviors that are illegal (such as, drinking and driving, steroid use, drinking prior to age 21). Finally, comparisons of the prevalence of health risk behaviors in the sample with national data were difficult, given differences in sample composition, question wording, and reporting of results.

Considering the injury data analysis, the follow-up visit coding methodology used in this study may have resulted in an underestimation of the number of unique (incident) injuries, and subsequently an underestimation of the number of persons with multiple injuries. However, the primary outcomes of interest in this analysis were dichotomous variables (one or more injuries, yes/no) used in prior investigations of Army basic training injuries that would not have been affected by multiple injury counts for the same individuals.

Construction of the risk indices was conducted with a number of limitations. First, given that factor analysis was designed for use with interval data, nonrandom measurement error due to groupings of ordinal responses into scaled items may distort the factor analysis results. However, Nunnally has suggested that it is legitimate to treat behavioral measures as interval scales and to use statistical analyses that rely on interval data (DeVellis 1991). Support for this argument is demonstrated in the literature, as factor analysis has been used in numerous studies of health risk behaviors (Donovan, Jessor et al. 1988; Alexander, Ensminger et al. 1992; Gullone and Moore 2000; Adelman 2005; Koven, McColl et al. 2005)

Second, it has been suggested that factors should consist of at least four variables with loadings above 0.5; if a factor is not at least that strong, "it would be best to ignore it" (Nunnally 1978). Other researchers have also used this cut point when defining factors (Gullone and Moore 2000; Kulbok and Cox 2002). Validity of the analysis may have been reduced by the use of indices with less than four variables.

Third, measures of internal consistency indicated that the indices were not as reliable as might be desired (Cronbach alphas < 0.7). The limited variability of responses among certain questions used to create the risk indices (such as, 60% never smoked regularly, 63% always wore a seatbelt, 88% did not use smokeless tobacco) may have contributed to these lower reliability results (Nunnally 1978). Alternatively, a higher percentage of missing values (such as, 7% missing age first started smoking) or misclassification bias resulting from misinterpretation of questions could have also contributed to the lower reliability estimates. Fourth, the variance explained by the final factor analysis model (54.5%) was not as impressive as that seen with the YRBS, for which 74% of the variance in behaviors has been explained by factors created from its data (Kulbok and Cox 2002). However, this model's explanation of variance was comparable to other published behavioral measures (Alexander, Young et al. 1990; Gullone and Moore 2000).

This study also focused only on selected measures of health risk behaviors and did not distinguish between delinquent behavior, as was done in other studies (Alexander, Young et al. 1990; Greene, Krcmar et al. 2000; Gullone and Moore 2000; Flay, Graumlich et al. 2004). Inclusion of health risk behaviors that are not considered high-risk or delinquent may have lessened the strength of the combined risk-taking measure.

Finally, results suggested that the combined risk-taking measure more accurately summarized risk-taking tendencies among males than among females. This was not surprising, since the combined risk-taking index was developed based on the entire sample, and the sample contained a higher proportion of males than females. If a separate combined risk-taking index had been created by gender, indices such as smokeless tobacco use would not have been included for females, thus creating a more accurate representation of female risk-taking tendency. Similarly, the combined risk-taking index might have been improved for males by dropping the weight control practices index and adding a risk index addressing sexual behaviors, since these behaviors were associated with injury risk in unadjusted analyses.

11. STRENGTHS.

Assessment of generalizability to the population from which the sample was drawn indicated that, while there were a number of demographic differences (race, age, marital status, pay grade, and component), neither males nor females were less likely to have completed a RAP questionnaire. Injury and illness rates, BMI, and run time on the initial APFT among participants and non-participants also did not differ statistically.

Comparison with U.S. population data indicated that, despite lower RAP participation among blacks, the proportion of blacks in the study sample was higher than the proportion of blacks in other surveys of health risk behaviors (Grunbaum, Kann et al. 2002; Substance Abuse and

Mental Health Services Administration (SAMHSA) 2004). Thus, this study fills a gap in information on ethnically diverse populations (Jessor 1993).

Use of available military medical surveillance data offered a number of advantages. First, since demographic and medical surveillance data were obtained for all trainees in the basic training units included in this study, it was possible to evaluate differences between participants and non-participants. Second, injury outcome data were captured in the surveillance system using a standardized methodology and without regard to work-relatedness (Amoroso, Smith et al. 2002). All study subjects had access to comprehensive medical care, a powerful incentive to seek treatment and a situation that removed potential bias due to differential access to care (Senier, Bell et al. 2002). Visits beyond the military health care system are also captured in the surveillance data, thus information on injury outcomes was very complete. All study subjects were also living in the same physical surroundings, under the observation of drill sergeants twenty-four hours a day, and were required to participate in and complete the same training. With little variation in environmental and occupational exposures, behavioral factors associated with injury risk were more likely to be identified.

The injury definition used in this study was consistent with previous studies of Army training-related injuries. Unlike other studies of occupational injury (Smith, Wellman et al. 2005), Army injury investigations routinely consider musculoskeletal disorders, typically overuse-related conditions (such as, stress fractures, joint pain) related to occupational tasks. Given the effects and magnitude of chronic low back pain and other cumulative stress disorders on workplace performance (Andersson, Fine et al. 1995), inclusion of these codes is key to understanding the full magnitude of the occupational injury problem.

While there were limitations to the use of self-reported health risk behavior data, test-retest analysis has demonstrated the reliability of RAP health risk behavior information (Canada, Canham-Chervak et al. 2005). Additionally, this study offered the advantage of considering multiple measures (questionnaire items) of a health risk behavior in defining level of risk, rather than relying on one measure per health risk behavior, as has been done in several studies of injury risk and multiple health risk behaviors (Pickett, Garner et al. 2002; Pickett, Schmid et al. 2002).

12. IMPLICATIONS.

This study adds to the existing literature in three important ways: (1) it contributes to knowledge on risk factors for an understudied subset of injuries, occupational injuries, in an understudied subset of the population, young adults; (2) it contributes to knowledge on risk-taking, an injury risk factor that has been identified as needing further study; and (3) it specifically addresses a gap in knowledge on behavioral risk factors for military training-related injury. As is evidenced by the identification of only six high-quality analytic studies in a recent review of the literature (Turner, 2004), the study of risk-taking behavior and unintentional injury is in its infancy.

Results of this study add to the body of knowledge supporting the need to consider effects of multiple health risk behaviors on injury risk (Jovic, Vorko et al. 2001; Pickett, Garner et al.

2002; Pickett, Schmid et al. 2002; Watt, Purdie et al. 2004; Koven, McColl et al. 2005). In addition, results add to the evidence of a “risk behavior syndrome”, or co-occurrence of health risk behaviors within young adults and adolescents. This information is especially important for the military public health community, as these data suggest that a multi-faceted approach to prevention, addressing multiple health risk behaviors, is needed. This approach as has been suggested elsewhere, in reference to interventions for the general U.S. adolescent and young adult populations (Federal Advisory Panel on Health Promotion Strategies for High-Risk Youth 1993; DiClemente, Hansen et al. 1996; Wiley, James et al. 1997).

This study also adds to the literature demonstrating that surveys collecting multiple risk behavior data can be used to develop proxy indicators of risk-taking (Pickett, Garner et al. 2002; Pickett, Schmid et al. 2002; Koven, McColl et al. 2005). This demonstrated utility of health risk behavior surveys is especially important for the military services, as completion of a health risk behavior survey based on the RAP will soon be required of all persons entering the U.S. military.

The comparison of this sample to the general U.S. population suggests that the U.S. Army does not necessarily consist of large numbers of ‘risk-takers’. Rather, the Army basic training population appears to reflect health risk behavior trends reported in multiple surveys of the general U.S. youth population. Similarities in the prevalence of these behaviors suggest that, in the absence of routine analysis and reporting of health risk behavior data from Army basic training populations, results from routinely-reported national youth surveys could be used to inform decisions related to health promotion program and policy planning for Army basic training.

Finally, the results of this study suggest that risk-taking is an independent predictor of training-related injury risk during Army basic training. It appears that some level of risk-taking may protect females entering basic training from injury, but among males, both low and high levels of risk-taking lead to higher risks of injury -- injury that could result in an early end to an Army career. Given the growing demands on our nation’s military services, it is in our best interest to provide the best chance for successful completion of this first phase of training for those who made the choice to “sign up”. Providing the best chance for success means protecting trainees from injury. This could be accomplished by ensuring safe training practices, such as providing protective gear, ensuring protective gear is worn during training, maintaining safety equipment on training courses, and following Army physical training programs designed to prevent over-training injuries. In addition, it is possible that safety instruction could be incorporated into training. Such an approach has proved beneficial in preventing occupational injuries among at least one other adolescent population (Reed, Westneat et al. 2003).

13. RECOMMENDATIONS FOR FUTURE RESEARCH.

These data can and should also be used to investigate the relationship between the combined risk-taking index and another life-compromising outcome, inability to complete basic training. With approximately 14% of personnel attriting during the first six months of enlistment (General Accounting Office 2000) and immediate costs of losing one recruit during basic training approximately \$47,000 (2002 dollars) (Sheppard 2002), there is a great need to understand factors contributing to the inability to succeed in basic training.

Additionally, an investigation of the relationship between health risk behaviors and injury risk beyond basic training should be pursued. This relationship is likely to be very different after basic training, as Soldiers are given greater control over their time, training, and health risk behavior decisions. In these less restrictive environments, individual risk-taking tendencies may be more likely to be expressed and exposure to potential injury-producing events, such as drinking and driving, are likely to be greater.

The RAP survey offers a wealth of information on characteristics that are not often measured and could be linked, as done in this study, to health and life outcomes. For example, the concept of resiliency could be investigated by linking RAP data on protective factors (such as, familial composition, social support) and measures of positive risk behaviors (such as, exercise, nutrition, educational achievement) to outcomes such as attrition and injury. The association of childhood environmental factors with subsequent pregnancy might also be evaluated, as has been done in a civilian population (Hockaday, Crase et al. 2000). In addition, in consonance with Jessor's model of adolescent risk behavior, the RAP survey data could be used to explore relationships between social environmental factors (such as, parental divorce, stress in the home, lack of parental warmth or support) and the subsequent development of health risk behaviors; a relationship for which there is considerable support (Shedler and Block 1990; Jessor 1991; Flay, Petraitis et al. 1999), but for which additional research is needed (Jessor, Turbin et al. 1998; Moore and Parsons 2000).

The impact of health risk behaviors is not limited to long-term health effects; rather, a growing body of evidence suggests that health risk behaviors are also associated with short-term health and life-compromising outcomes such as injury and inability to perform occupational-related duties. Such short-term effects have immediate impact on employability or "readiness" of individuals and teams or units. As a step toward addressing these adverse effects, routine analysis and reporting of health risk behaviors in the U.S. Army and other military populations should be supported and pursued. As is seen in civilian populations (Everett, Kann et al. 1997), such health risk behavior surveillance is essential for the development of informed, evidence-based health promotion program and policy planning, appropriate focusing of scarce public health resources on leading health risk behaviors, and the evaluation of effects of programs established to reduce health risk behaviors.

14. POINT OF CONTACT. The USACHPPM point of contact for this report is Dr. Michelle Chervak. Dr. Chervak may be contacted by e-mail at Michelle.Chervak@us.army.mil, commercial phone at (410) 436-1377 or 3534, or DSN 584-1377 or 3534.

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APPENDIX A

U.S. ARMY RECRUIT ASSESSMENT PROGRAM PILOT STUDY
QUESTIONNAIRE

Recruit Assessment Program

Please complete the questionnaire as accurately as possible.
DO NOT LEAVE ANY QUESTIONS BLANK.
 Thank you for your assistance.

MARKING INSTRUCTIONS

Use **BLACK** or **BLUE** ink.

Mistakes must be crossed-out with an "X."

Print in **CAPITAL LETTERS** and avoid contact with the edge of the box. **EXAMPLE:**

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Example of numbers:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|

Shade circles and boxes like this:






































































































Not like this:



Last Name

[illegible]**First Name****Middle Initial**[illegible]

| |  |  |  | - |  |  | - |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 |  |  |  | |  |  | |  |  |  |  |
| 2 |  |  |  | |  |  | |  |  |  |  |
| 3 |  |  |  | |  |  | |  |  |  |  |
| 4 |  |  |  | |  |  | |  |  |  |  |
| 5 |  |  |  | |  |  | |  |  |  |  |
| 6 |  |  |  | |  |  | |  |  |  |  |
| 7 |  |  |  | |  |  | |  |  |  |  |
| 8 |  |  |  | |  |  | |  |  |  |  |
| 9 |  |  |  | |  |  | |  |  |  |  |
| 0 |  |  |  | |  |  | |  |  |  |  |

Please enter the correct letter or number of your company and platoon:

1

Company

| | |
|--|--|
| | |
|--|--|

Platoon

Please write in the state and zip code of your most recent home address:

State

| | |
|--|--|
| | |
|--|--|

Zip Code

| | | | | |
|--|--|--|--|--|
| | | | | |
|--|--|--|--|--|

| | |
|----|----------------------|
| TX | Texas |
| UT | Utah |
| VT | Vermont |
| VA | Virginia |
| WA | Washington |
| WV | West Virginia |
| WI | Wisconsin |
| WY | Wyoming |
| AS | American Samoa |
| DC | District of Columbia |
| GU | Guam |
| TT | Marshall Islands |
| PR | Puerto Rico |
| VI | U.S. Virgin Islands |

Recruit Assessment Program-1

CHPPM Form 429(TEST), Aug02 (MCHB-TS-EIP)

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SECTION 1: Induction Information

1. Have you ever served in the U.S. military before now?

☐ No ☐ Yes

-- IF YES, from

| | | | | | | | | | | |
|------|--|--|--|--|----|------|--|--|--|--|
| | | | | | to | | | | | |
| Year | | | | | | Year | | | | |

2. Which one of the following are you joining?

☐ Active Duty ARMY
☐ ARMY Reserve
☐ ARMY National Guard

3. Are you a National Guard or Reserve soldier still in high school (split-options program)?

☐ No ☐ Yes

4. What date did you begin current military training? (date you arrived at Fort Jackson)

| | | | | | | | |
|------|--|---|-------|--|---|-----|--|
| | | / | | | / | | |
| Year | | | Month | | | Day | |

5. What is your gender?

☐ Male
☐ Female

6. Did your father serve in the U.S. military?

☐ No ☐ Yes ☐ Don't know

7. Did your mother serve in the U.S. military?

☐ No ☐ Yes ☐ Don't know

8. Why did you join the military? (mark all that apply)

☐ For education and new job skills
☐ For travel or adventure
☐ For a job to earn money
☐ To leave problems at home
☐ Family member in the military
☐ 20-year career in military
☐ To serve my country
☐ Other reasons

9. What is your date of birth?

| | | | | | | | |
|------|--|---|-------|--|---|-----|--|
| | | / | | | / | | |
| Year | | | Month | | | Day | |

10. Are you allergic to or do you have bad reactions to: (mark all that apply)

| | |
|-------------------------------------|--|
| <input type="radio"/> Shell fish | <input type="radio"/> Sulfa drugs |
| <input type="radio"/> Milk | <input type="radio"/> Narcotic drugs (like Codeine) |
| <input type="radio"/> Eggs | <input type="radio"/> Any other drug |
| <input type="radio"/> Iodine | <input type="radio"/> Bee stings |
| <input type="radio"/> Latex | <input type="radio"/> Other allergy |
| <input type="radio"/> Adhesive tape | <input type="radio"/> Unsure |
| <input type="radio"/> Aspirin | <input type="radio"/> I do not have any of these allergies |
| <input type="radio"/> Penicillin | |

Recruit Assessment Program -2

CHPPM Form 429(TEST), Aug02 (MCHB-TS-EIP)

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SECTION 2: General Information**1. Where were you born?**

- ☐ United States or U.S. Territory ☐ Caribbean ☐ Africa
☐ Canada ☐ Europe ☐ Pacific Islands
☐ Mexico ☐ Asia
☐ Central/South America ☐ Other

2. If you were born in the U.S., in which state?

| | |
|--|--|
| | |
|--|--|

(See previous Address Page for a list of state/territory abbreviations)

3. What best describes your racial/ethnic background? (mark all that apply)

- ☐ Native American or Alaskan Native
☐ Asian
☐ Pacific Islander/Filipino
☐ Black (African-American)
☐ Hispanic, Latino, or Spanish descent
☐ White (Caucasian)
☐ Other

4. Where did you live most of the time as a child? (choose only one answer)

- ☐ On a farm, ranch, or in the country
☐ In a small town with less than 10,000 people
☐ In a small city with about 10,000 to 100,000 people
☐ In a large city or suburb with over 100,000 people
☐ Moved around a lot to different cities
☐ Not sure

5. What is the furthest you've gone in school? (choose only one answer)

- ☐ Some high school but no diploma
☐ Obtained GED (General Education Diploma)
☐ Graduated from high school
☐ Some college or technical school
☐ Graduated from trade or technical school
☐ Graduated from 4-year college or university
☐ Completed Masters or higher post-graduate degree

6. What is your current marital status? (choose only one answer)

- ☐ Single ☐ Married but separated
☐ Living together ☐ Divorced
☐ Married ☐ Widowed

SECTION 3: Work History**1. During your last year of high school, did you work full- or part-time after school or in the summer?**

☐ No ☐ Yes

2. Please mark if you ever had a job that lasted more than one month where you were around any of the following materials on most days:

| | No | Yes | Don't Know |
|---|-----------------------|-----------------------|-----------------------|
| Dust | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Loud noise | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Fumes from gasoline, paint, or degreasers | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Insecticides, pesticides, or herbicides (weed killers) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Asbestos | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Ionizing radiation, like x-rays or radioactive material | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Welding material | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Smoke from burning things | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lead (like inside car batteries) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

3. Do you have any health problems you feel were caused by a previous job?

☐ No ☐ Yes

4. Have you ever been injured in a job that caused you:

| | No | Yes |
|--|-----------------------|-----------------------|
| To be treated in a medical clinic by a doctor or nurse | <input type="radio"/> | <input type="radio"/> |
| To be hospitalized overnight or longer | <input type="radio"/> | <input type="radio"/> |
| To miss more than one day of work | <input type="radio"/> | <input type="radio"/> |

Recruit Assessment Program -3

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SECTION 4: Family History

1. Were you mostly raised by: (Mark all that apply.)

- ☐ Two parents ☐ Foster parent(s) or guardian(s)
☐ One parent ☐ In a group home or institution
☐ Grandparent(s)
☐ Other relative(s) ☐ Other

2. Were you adopted as a child?

- ☐ No ☐ Yes ☐ Don't know

3. Are you a twin?
(or triplet or one of a multiple birth set)

- ☐ No ☐ Yes ☐ Don't know

4. How many brothers and sisters were (including step-brothers and sisters) were raised in the same home with you? (add all together)

Number of siblings:

| | |
|--|--|
| | |
|--|--|

5. How far did the father who raised you go in school? (choose only one answer)

- ☐ Did not complete high school
☐ Completed high school or earned a GED
☐ Some college/technical school
☐ 4-year college or university degree
☐ Masters or higher degree
☐ Don't know
☐ This does not apply to me

6. How far did the mother who raised you go in school? (choose only one answer)

- ☐ Did not complete high school
☐ Completed high school or earned a GED
☐ Some college/technical school
☐ 4-year college or university degree
☐ Masters or higher degree
☐ Don't know
☐ This does not apply to me

7. Is the mother who raised you alive?

- ☐ Yes
☐ No, she died before I was 10 years old
☐ No, she died after I was 10 years old
☐ Don't know
☐ This does not apply to me

8. Is the father who raised you alive?

- ☐ Yes
☐ No, he died before I was 10 years old
☐ No, he died after I was 10 years old
☐ Don't know
☐ This does not apply to me

9. Has your biological mother or father ever had:

| | <u>No</u> | <u>Yes</u> | <u>Don't Know</u> |
|------------------------------|-----------------------|-----------------------|-----------------------|
| High blood pressure | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Heart attack | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Stroke | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Colon cancer | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lung cancer | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Diabetes | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Mental or emotional problems | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Alcohol problem | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

10. Has your biological mother, sisters, or aunts ever had breast cancer?

- ☐ No
☐ Yes
☐ Don't know

11. Has your biological father, brothers, or uncles ever had prostate cancer?

- ☐ No
☐ Yes
☐ Don't know

Recruit Assessment Program -4

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SECTION 5: Clinical History**1. How tall are you without shoes?**

| | | | |
|------|---|--------|--|
| | - | | |
| Feet | | Inches | |

2. How much do you weigh without shoes?

| | | |
|--------|--|--|
| | | |
| Pounds | | |

3. Are you mainly right or left handed?

☐ Right ☐ Left ☐ Both

4. How many different prescription drugs provided by a doctor are you currently taking each week?

☐ None ☐ 3
☐ 1 ☐ 4
☐ 2 ☐ 5 or more

5. Which of the following health care providers evaluated or treated you in the last 5 years: (mark all that apply)

- ☐ A general, family, or other medical doctor
- ☐ A mental health professional
- ☐ A dentist
- ☐ A surgeon
- ☐ An optometrist (eye doctor)
- ☐ A specialist or counselor in alcohol drinking problems
- ☐ An alternative health practitioner (acupuncturist, herbalist, chiropractor)
- ☐ None of the above

6. Have you ever had trouble with the following ANYTIME during your life? (mark each complaint)

Yes No

- | | | |
|---------------------------|--------------------------|--|
| <input type="radio"/> Yes | <input type="radio"/> No | Chronic cough or cough at night |
| <input type="radio"/> Yes | <input type="radio"/> No | Asthma |
| <input type="radio"/> Yes | <input type="radio"/> No | Shortness of breath |
| <input type="radio"/> Yes | <input type="radio"/> No | Hay fever |
| <input type="radio"/> Yes | <input type="radio"/> No | Arthritis, rheumatism, bursitis |
| <input type="radio"/> Yes | <input type="radio"/> No | Swollen, stiff, or painful joints |
| <input type="radio"/> Yes | <input type="radio"/> No | Foot trouble (pain, corns, bunions) |
| <input type="radio"/> Yes | <input type="radio"/> No | Knee trouble (locking or giving out) |
| <input type="radio"/> Yes | <input type="radio"/> No | Scoliosis or curvature of the spine |
| <input type="radio"/> Yes | <input type="radio"/> No | Dizziness, fainting, lightheadedness |
| <input type="radio"/> Yes | <input type="radio"/> No | Frequent or severe headaches |
| <input type="radio"/> Yes | <input type="radio"/> No | Difficulty concentrating |
| <input type="radio"/> Yes | <input type="radio"/> No | Skin diseases or rashes |
| <input type="radio"/> Yes | <input type="radio"/> No | Chest pain or pressure |
| <input type="radio"/> Yes | <input type="radio"/> No | Sleepwalking |
| <input type="radio"/> Yes | <input type="radio"/> No | Bed wetting |
| <input type="radio"/> Yes | <input type="radio"/> No | Trouble stuttering |
| <input type="radio"/> Yes | <input type="radio"/> No | Acne or skin problems |
| <input type="radio"/> Yes | <input type="radio"/> No | Frequent indigestion |
| <input type="radio"/> Yes | <input type="radio"/> No | Constipation or loose bowels |
| <input type="radio"/> Yes | <input type="radio"/> No | Muscle aches |
| <input type="radio"/> Yes | <input type="radio"/> No | Pain or problems during sexual intercourse |

7. Have you ever been hospitalized overnight or longer?

- ☐ No
- ☐ Yes
- ☐ Don't know

Recruit Assessment Program -5

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SECTION 6: Use of Tobacco

1. Have you smoked more than 100 cigarettes (5 packs) in your entire life?

☐ No ☐ Yes

2. Have you ever tried to quit smoking cigarettes?

☐ I have never smoked regularly
☐ Yes, and I never smoked again
☐ Yes, but I could not quit permanently
☐ I smoke but have not tried to stop

3. In the year before entering the military, did you smoke cigarettes?

☐ Not at all ☐ Some days ☐ Every day

4. At what age did you first start smoking regularly (meaning, you smoked most days)?

☐ I have never smoked regularly

Age you started:

| | |
|--|--|
| | |
|--|--|

 (Years old)

5. How many years did you smoke more than 3 cigarettes on most days?

☐ I have never smoked regularly
☐ 1 year or less ☐ 5 years
☐ 2 years ☐ 6 years
☐ 3 years ☐ 7 years
☐ 4 years ☐ 8 or more years

6. When you were smoking regularly, how many packs did you smoke each day?

☐ I have never smoked regularly
☐ About 1/2 pack or less per day
☐ About 1 pack a day
☐ Between 1 and 2 packs
☐ 2 packs or more

7. When did you last smoke a cigarette?

☐ I have never smoked
☐ More than 1 year ago
☐ More than 1 month ago
☐ More than 1 week ago
☐ Within the last few days

8. Did you use any of the following 3 or more times during the past year?

| | No | Yes |
|--------------------------------------|-----------------------|-----------------------|
| Pipe | <input type="radio"/> | <input type="radio"/> |
| Cigar | <input type="radio"/> | <input type="radio"/> |
| Smokeless tobacco (dip, chew, snuff) | <input type="radio"/> | <input type="radio"/> |

9. How many years did you use smokeless tobacco (chew, dip, snuff) on most days?

☐ I have never used dip/chew/snuff regularly
☐ 1 year or less ☐ 5 years
☐ 2 years ☐ 6 years
☐ 3 years ☐ 7 years
☐ 4 years ☐ 8 or more years

10. When you were using smokeless tobacco regularly, how many cans did you use each day?

☐ I have never used dip/chew regularly
☐ About 1/2 can or less per day
☐ About 1 can a day
☐ Between 1 and 2 cans
☐ 2 cans or more

11. Did your father or mother (or anyone else living in your home) regularly smoke tobacco when you were a child?

☐ No ☐ Yes

Recruit Assessment Program -6

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SECTION 7: Use of Alcohol

The following questions refer to this definition:

ONE DRINK equals: 1 bottle or can of beer,
1 glass of wine,
1 wine cooler, or
1 shot of hard liquor

1. During the past 12 months, have you had at least one drink containing alcohol?

☐ No ☐ Yes

2. How old were you when you first had a drink containing alcohol? (*choose only one answer*)

☐ I have never had a drink ☐ 16 to 17 years old
☐ 13 years or younger ☐ 18 to 20 years old
☐ 14 to 15 years old ☐ 21 years or older

3. How many years have you been drinking alcoholic beverages on a regular basis? (*choose only one answer*)

☐ I have never drunk alcohol ☐ 2 to 5 years
☐ I just tried alcohol a few times ☐ 6 to 10 years
☐ 1 year or less ☐ 11 or more years

4. During the year (12 months) before entering the military, how often did you have a drink containing alcohol? (*choose only one answer*)

☐ Never ☐ Monthly
☐ Once/Twice ☐ Weekly
☐ A few times ☐ Daily

5. During the past year, how often did you have 6 or more drinks at one sitting? (*choose only one answer*)

☐ Never ☐ Monthly
☐ Once/Twice ☐ Weekly
☐ A few times ☐ Daily

6. During the past year, how many drinks containing alcohol did you have on a typical day of drinking? (*choose only one answer*)

☐ None, I do not drink ☐ 5 or 6
☐ 1 or 2 ☐ 7 to 9
☐ 3 or 4 ☐ 10 or more

The following questions refer to alcohol-related events during the past year.

| | <u>Never</u> | <u>Yes, but more than 1 year ago</u> | <u>Yes, during the past year</u> |
|--|-----------------------|--------------------------------------|----------------------------------|
| 7. Have you ever failed to do what was normally expected of you because of drinking? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 8. Have you or has someone else been physically injured because of your drinking? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 9. Did you ever feel as though you needed to cut down on your drinking? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 10. Did you ever feel annoyed because someone in your life said you needed to cut down on your drinking? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 11. Did you ever feel guilty after drinking? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 12. Did you ever need a first drink, or eye-opener, in the morning following a day or night of heavy drinking? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 13. Did you ever feel as though you could not stop drinking once you started? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 14. Have you ever driven a car within two hours of drinking two or more alcoholic drinks? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

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SECTION 8: Diet and Health

Questions 1-5 refer to the past YEAR (12 months):

1. About how many hours did you sleep on most nights?

| | |
|---------------------------------------|--|
| <input type="radio"/> 4 hours or less | <input type="radio"/> 7 to 8 hours |
| <input type="radio"/> 5 hours | <input type="radio"/> 9 hours |
| <input type="radio"/> 6 hours | <input type="radio"/> 10 hours or more |

2. About how many hours did you watch TV (television) on an average day?

| | |
|--------------------------------------|---------------------------------------|
| <input type="radio"/> None | <input type="radio"/> 2 to 3 hours |
| <input type="radio"/> 1 hour or less | <input type="radio"/> 4 or more hours |

3. On an average day, about how many cups, bottles, or cans of drink with caffeine did you drink (like coffee, tea, or coke/soda/pop)?

| | |
|----------------------------|---------------------------------|
| <input type="radio"/> None | <input type="radio"/> 3 |
| <input type="radio"/> 1 | <input type="radio"/> 4 to 5 |
| <input type="radio"/> 2 | <input type="radio"/> 6 or more |

4. About how many times each week did you eat from a fast food restaurant (like hamburgers, tacos, or pizza)?

| | |
|------------------------------|--|
| <input type="radio"/> None | <input type="radio"/> 4 to 7 |
| <input type="radio"/> 1 | <input type="radio"/> 8 to 14 |
| <input type="radio"/> 2 to 3 | <input type="radio"/> 15 or more times |

5. About how often each week did you eat breakfast?

| | |
|---------------------------------------|---------------------------------------|
| <input type="radio"/> Never | <input type="radio"/> 3 or 4 mornings |
| <input type="radio"/> 1 or 2 mornings | <input type="radio"/> 5 to 7 mornings |

6. During the past year, in a typical week, how often did you participate in a physical sport or activity that made you sweat and breathe hard for at least 20 minutes (such as basketball, biking, or fast dancing)?

| | |
|---|--|
| <input type="radio"/> I never exercised that hard | <input type="radio"/> 3 times per week |
| <input type="radio"/> 1 time per week | <input type="radio"/> 4 or 5 times per week |
| <input type="radio"/> 2 times per week | <input type="radio"/> 6 or more times per week |

7. During your last year of high school, how many sport teams or organized physical activity programs did you participate in?

| | |
|----------------------------|---------------------------------|
| <input type="radio"/> None | <input type="radio"/> 2 |
| <input type="radio"/> 1 | <input type="radio"/> 3 or more |

8. What has happened to your weight in the last year?

| |
|---|
| <input type="radio"/> Lost more than 10 pounds because of dieting |
| <input type="radio"/> Lost more than 10 pounds without dieting |
| <input type="radio"/> Stayed about the same |
| <input type="radio"/> Gained more than 10 pounds |

9. Have you ever taken diet pills to lose weight?

| | |
|--------------------------|---------------------------|
| <input type="radio"/> No | <input type="radio"/> Yes |
|--------------------------|---------------------------|

10. Have you ever used laxatives to lose weight?

| | |
|--------------------------|---------------------------|
| <input type="radio"/> No | <input type="radio"/> Yes |
|--------------------------|---------------------------|

11. Have you ever caused yourself to vomit to lose weight?

| | |
|--------------------------|---------------------------|
| <input type="radio"/> No | <input type="radio"/> Yes |
|--------------------------|---------------------------|

12. Have you ever used steroids to gain weight or increase muscle strength?

| | |
|--------------------------|---------------------------|
| <input type="radio"/> No | <input type="radio"/> Yes |
|--------------------------|---------------------------|



SECTION 9: General History

1. How many close friends or relatives do you have that you can call on for help or talk to about personal problems?
☐ None ☐ 2 ☐ 5 or more
☐ 1 ☐ 3 to 4
2. How often do you attend church, synagogue, or other religious gathering?
☐ Almost never ☐ About once a week
☐ About once or twice a year ☐ More than once a week
☐ About once a month
3. Are your parents divorced?
☐ No
☐ Yes, before I was 10 years old
☐ Yes, after I was 10 years old
☐ Don't know
☐ They were never married
4. During the year before entering the military, did you: *(mark all that apply)*
☐ Get married
☐ Have a child
☐ Get divorced
☐ Get arrested by the police
☐ Get fired from a job
☐ Experience the death of someone close to you
☐ None of these events happened to me
5. Do you sometimes get mad enough to hit, kick, or throw things?
☐ Never ☐ About once a week
☐ About once a year ☐ More than once a week
☐ About once a month
6. How many traffic tickets for moving violations have you ever received (such as speeding or running a red light)?
☐ None ☐ 2 ☐ 5 to 10
☐ 1 ☐ 3 to 4 ☐ 11 or more
7. How often do you wear a seat belt when driving or riding in a car?
☐ Never ☐ Sometimes ☐ Usually ☐ Always
8. How old were you when you had sexual intercourse for the first time?
☐ I have never had sex ☐ 16 to 17 years old
☐ 13 years of age or younger ☐ 18 to 20 years old
☐ 14 to 15 years old ☐ 21 years old or older
9. Did you or your partner use a condom (rubber) the last time you had sex?
☐ No ☐ Yes ☐ I have not had sex
10. Have you ever been told by a doctor or nurse that you had a sexually transmitted disease or STD (like chlamydia, gonorrhea, genital herpes, or syphilis)?
☐ No ☐ Yes ☐ Don't know

The following are statements about you when you were growing up, before you were 17 years old. Please choose the ONE answer that comes closest to the way you felt.

11. There was someone to take care of you and protect you.
☐ Never true ☐ Rarely true ☐ Sometimes true ☐ Often true ☐ Very often true
12. You felt loved.
☐ Never true ☐ Rarely true ☐ Sometimes true ☐ Often true ☐ Very often true
13. How often did a parent or adult living in your home swear at you, insult you, or put you down?
☐ Never ☐ Once/Twice ☐ Sometimes ☐ Often ☐ Very often

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SECTION 9: General History*(continued) While you were growing up...*

14. How often did a parent or other adult living in your home push, grab, shove, slap, or throw something at you? ☐ Never ☐ Once/Twice ☐ Sometimes ☐ Often ☐ Very often

15. How often did a parent or other adult living in your home push, grab, shove, slap, or throw something at each other? ☐ Never ☐ Once/Twice ☐ Sometimes ☐ Often ☐ Very often

16. How often did an adult ever touch you sexually or try to make you touch them sexually? ☐ Never ☐ Once/Twice ☐ Sometimes ☐ Often ☐ Very often

17. Did you live with someone who was depressed or mentally ill? ☐ No ☐ Yes

18. Did you live with someone who was a problem drinker or alcoholic? ☐ No ☐ Yes

Did any of the following events EVER happen to you in your entire life?

| | <u>No</u> | <u>Yes</u> |
|---|-----------------------|-----------------------|
| 19. You were in an accident where you could have been killed but were not badly hurt. | <input type="radio"/> | <input type="radio"/> |
| 20. You were in an accident where you were injured and had to spend at least one night in the hospital. | <input type="radio"/> | <input type="radio"/> |
| 21. You saw a close family member or friend being badly injured or killed. | <input type="radio"/> | <input type="radio"/> |
| 22. You saw a stranger being badly injured or killed. | <input type="radio"/> | <input type="radio"/> |
| 23. You were seriously attacked, beaten up, or assaulted. | <input type="radio"/> | <input type="radio"/> |
| 24. You were threatened with a knife, gun, club, or other weapon. | <input type="radio"/> | <input type="radio"/> |
| 25. You were raped (someone forced you to have sex against your will). | <input type="radio"/> | <input type="radio"/> |

The following questions are about activities you might have done during a typical day before entering the military. Did your health limit you in these activities?

| | <u>NO</u> <u>Not limited</u> <u>at all</u> | <u>YES</u> <u>Limited</u> <u>a little</u> | <u>YES</u> <u>Limited</u> <u>a lot</u> |
|---|--|---|--|
| 26. Vigorous activities, such as running, lifting heavy objects, or participating in strenuous sports | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 27. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 28. Climbing one flight of stairs | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 29. Climbing several flights of stairs | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 30. Bending, kneeling, or stooping | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |



SECTION 9: General History, continued

These questions are about how you felt and how things were with you during the past year. Please choose the ONE answer that comes closest to the way you felt.

HOW MUCH TIME:

| | <u>None of the time</u> | <u>A little of the time</u> | <u>Some of the time</u> | <u>Most of the time</u> | <u>All of the time</u> |
|---|-----------------------------|---------------------------------|-----------------------------|-----------------------------|----------------------------|
| 31. Did you feel calm and peaceful? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 32. Did you feel downhearted and blue? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 33. Has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc)? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 34. Have you been a very nervous person? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 35. Have you felt so down in the dumps nothing could cheer you up? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 36. Did you have a lot of energy or pep? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 37. Did you feel tired or worn out? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 38. Did you have difficulty reasoning and solving problems, like making plans, decisions, or learning new things? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 39. Did you forget things that happened recently, like where you put things and when you had appointments? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 40. Did you have trouble keeping your attention on any activity for long? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 41. Did you have difficulty doing activities involving concentration and thinking? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

42. In general, your health is:

- ☐ Excellent ☐ Fair
☐ Very good ☐ Poor
☐ Good

43. In general, did your health change during the past year (12 months) before entering the military?

- ☐ No, my health stayed about the same
☐ Yes, my health got somewhat worse
☐ Yes, my health got somewhat better

44. During the year before entering the military, how much did bodily pain interfere with your normal work (including work both outside the home, and housework)?

- ☐ Not at all ☐ Moderately ☐ Extremely
☐ A little ☐ Quite a lot

45. During the year prior to entering the military, did you have any of the following problems as a result of your PHYSICAL health?

- a. Accomplished less than you would like ☐ No ☐ Yes
 b. Were limited in any kind of work or other daily activities ☐ No ☐ Yes

46. During the year prior to entering the military, did you have any of the following problems as a result of any EMOTIONAL problems (such as feeling depressed or anxious)?

- a. Accomplished less than you would like ☐ No ☐ Yes
 b. Didn't do work or other activities as carefully as usual ☐ No ☐ Yes

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APPENDIX B

ICD-9-CM CODES INCLUDED IN THE ARMY MEDICAL SURVEILLANCE ACTIVITY INSTALLATION INJURY REPORTS AND TRAINING-RELATED INJURY REPORTS (TRAINING-RELATED INJURY REPORT CODES IN **BOLD**)

Codes, by Anatomical Region:

Head and neck

363.61 363.63 364.04 364.41 364.76 364.77 365.65 366.20 379.32 379.33 379.34 525.11 722.0
722.71 723.1 723.4 800 801 802 803 804 805.0 805.1 806.0 806.1 807.5 807.6 830 839.0 839.1
847.0 848.0 848.1 848.2 850 851 852 853 854 870 871 872 873 874 900 910.0 910.1 910.2 910.3
910.6 910.7 910.8 910.9 918 920 921 925 930 931 932 933 935.0 940 941 947.0 950 951 952.0
953.0 954.0 957.0 959.0

Shoulder and Arm

354.1 354.2 354.3 716.11 716.12 716.13 718.01 718.02 718.03 718.11 718.12 718.13 718.31
718.32 718.33 718.81 718.82 718.83 718.91 718.92 718.93 719.01 719.02 719.03 719.11 719.12
719.13 719.41 719.42 719.43 726.0 726.1 726.2 726.3 727.61 727.62 733.11 810 811 812 813
818 831 832 840 841 880 881.00 881.01 881.10 881.11 881.20 881.21 887 903.0 903.1 912.0
912.1 912.2 912.3 912.6 912.7 912.8 912.9 923.0 923.1 927.0 927.1 943 953.4 955.0 955.1 955.2
955.3 955.4 955.5 955.7 955.8 955.9 959.2

Hand and Wrist

354.0 716.14 718.04 718.14 718.34 718.84 718.94 719.04 719.14 719.44 726.4 727.63 727.64
733.12 814 815 816 817 833 834 842 881.02 881.12 881.22 882 883 885 886 903.4 903.5 914.0
914.1 914.2 914.3 914.6 914.7 914.8 914.9 915.0 915.1 915.2 915.3 915.6 915.7 915.8 915.9
923.2 923.3 927.2 927.3 944 955.6 959.4 959.5

Leg

716.15 716.16 718.05 718.15 718.35 718.85 718.95 **719.05** 719.15 **719.45** **726.5** **727.65** **733.14**
733.15 **733.93** 808.0 808.1 820 821 823 835 **843** **844.3** 890 897 904.0 904.1 904.2 904.3 904.5
924.0 924.10 928.0 928.10 945.00 945.04 945.06 945.09 945.10 945.14 945.16 945.19 945.20
945.24 945.26 945.29 945.30 945.34 945.36 945.39 945.40 945.44 945.46 945.49 945.50 945.54
945.56 945.59 956 959.6

Knee

717 718.36 718.86 **719.06** 719.16 **719.46** **726.6** **727.66** 822 836 **844.0** **844.1** **844.2** 924.11 928.11
945.05 945.15 945.25 945.35 945.45 945.55

Ankle and foot

716.17 718.07 718.17 718.37 718.87 718.97 **719.07** 719.17 **719.47** **726.7** **727.67** **727.68** **728.71**
733.94 **734** 824 825 826 837 838 **845** 892 893 895 896 904.6 917.0 917.1 917.2 917.3 917.6
917.7 917.8 917.9 924.2 924.3 928.2 928.3 945.01 945.02 945.03 945.11 945.12 945.13 945.21
945.22 945.23 945.31 945.32 945.33 945.41 945.42 945.43 945.51 945.52 945.53

Chest, back, and abdomen

720.2 721.7 722.1 722.72 722.73 **724.2** 724.3 724.4 **724.5 724.9** 733.13 805.2 805.3 805.4 805.5
805.6 805.7 806.2 806.3 806.4 806.5 806.6 806.7 807.0 807.1 807.2 807.3 807.4 808.2 808.3
808.4 808.5 808.8 808.9 809 839.2 839.3 839.41 839.42 839.51 839.52 839.61 839.71 **846** 847.1
847.2 847.3 847.4 847.9 848.3 848.4 **848.5** 860 861 862 863 864 865 866 867 868 869 875 876
877 878 879.0 879.1 879.2 879.3 879.4 879.5 879.6 879.7 901 902 911.0 911.1 911.2 911.3
911.6 911.7 911.8 911.9 922 926 934 935.1 935.2 936 937 938 939 942 947.1 947.2 947.3 947.4
952.1 952.2 952.3 952.4 953.1 953.2 953.3 953.5 954.1 954.8 954.9 959.1 959.11 959.12 959.19

Environmental

363.31 370.24 388.10 388.11 388.12 692.71 692.76 692.77 910.4 910.5 911.4 911.5 912.4 912.5
913.4 913.5 914.4 914.5 915.4 915.5 916.4 916.5 917.4 917.5 919.4 919.5 990 991 992 993 994

Unspecified

716.10 716.18 716.19 718.00 718.08 718.09 718.10 718.18 718.19 718.30 718.38 718.39 718.80
718.88 718.89 718.90 718.98 718.99 **719.00 719.08 719.09** 719.10 719.18 719.19 **719.40 719.48**
719.49 722.2 722.70 **726.8 726.9 727.2 727.3** 727.60 727.69 728.83 **729.1** 729.2 **733.10 733.16**
733.19 733.95 805.8 805.9 806.8 806.9 819 827 828 829 839.40 839.49 839.50 839.59 839.69
839.79 839.8 839.9 **844.8 844.9 848.8 848.9** 879.8 879.9 884 891 894 903.2 903.3 903.8 903.9
904.4 904.7 904.8 904.9 913.0 913.1 913.2 913.3 913.6 913.7 913.8 913.9 916.0 916.1 916.2
916.3 916.6 916.7 916.8 916.9 919.0 919.1 919.2 919.3 919.6 919.7 919.8 919.9 923.8 923.9
924.4 924.5 924.8 924.9 927.8 927.9 928.8 928.9 929 946 947.8 947.9 948 949 952.8 952.9
953.8 953.9 957.1 957.8 957.9 959.13 959.14 959.3 959.7 959.8 959.9 995.81 995.83 995.85

Note: All subordinate codes are included for 3 digit and 4 digit ICD9 codes.

Sources: (U.S. Army Center for Health Promotion and Preventive Medicine 2004) and (Hauret 2006)

APPENDIX C

CORRELATION MATRIX
PEARSON CORRELATION COEFFICIENTS

APPENDIX C. Correlation Matrix (Pearson Correlation Coefficients) for 23 Risk Factors Considered For Health Risk Behavior Indices

| | Age first cigarette use | Cigarette packs/day | Years smoked cigarettes | Cans/packs smokeless tobacco | Years used smokeless tobacco | Age at first drink | Years of alcohol use | AUDIT-C score | CAGE score | Drinking and driving | Moving violations | Hours of sleep | Seat belt use frequency | Hours of TV | Caffeinated beverages/day | Fast food eaten/week | Breakfast eaten/week | Diet pills ever used | Laxatives ever used | Vomiting ever used | STD ever diagnosed | Age at first intercourse | Condom use last sex |
|------------------------------|-------------------------|---------------------|-------------------------|------------------------------|------------------------------|--------------------|----------------------|---------------|------------|----------------------|-------------------|----------------|-------------------------|-------------|---------------------------|----------------------|----------------------|----------------------|---------------------|--------------------|--------------------|--------------------------|---------------------|
| Age first cigarette use | 1.0 | .22 | .38 | .02 | .00 | .32 | -.06 | .11 | -.03 | -.04 | -.02 | .00 | .09 | -.02 | .03 | .03 | .06 | -.04 | -.02 | -.02 | -.04 | .25 | .02 |
| Packs/day | | 1.0 | .80 | .24 | .18 | .27 | .36 | .38 | .20 | .24 | .21 | .06 | .19 | .00 | .23 | .09 | .11 | .06 | .00 | .04 | .04 | .28 | .13 |
| Years smoked | | | 1.0 | .21 | .16 | .28 | .39 | .35 | .18 | .22 | .20 | .09 | .17 | .01 | .19 | .06 | .10 | .06 | .00 | .03 | .04 | .32 | .14 |
| Amount smokeless tobacco/day | | | | 1.0 | .76 | .12 | .19 | .22 | .14 | .18 | .12 | .06 | .16 | -.01 | .11 | .03 | .06 | .01 | .01 | .05 | -.02 | .08 | .04 |
| Years smokeless used | | | | | 1.0 | .11 | .22 | .19 | .11 | .19 | .15 | .10 | .17 | -.01 | .08 | .05 | .05 | .02 | .00 | .04 | -.03 | .08 | .05 |
| Age at first drink | | | | | | 1.0 | .50 | .46 | .25 | .27 | .13 | .01 | .13 | -.03 | .04 | .07 | .04 | .11 | .07 | .10 | .04 | .33 | .11 |
| Years alcohol use | | | | | | | 1.0 | .64 | .32 | .41 | .30 | .07 | .12 | -.04 | .04 | .05 | .04 | .15 | .05 | .10 | .07 | .28 | .18 |
| AUDIT-C score | | | | | | | | 1.0 | .36 | .45 | .25 | -.01 | .23 | -.07 | .07 | .09 | .08 | .11 | .05 | .09 | .03 | .27 | .13 |

APPENDIX C. Correlation Matrix (Pearson Correlation Coefficients) for 23 Risk Factors Considered for Health Risk Behavior Indices (continued)

| | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|--|--|--|--|--|--|--|--|-----|-----|-----|-----|-----|------|------|------|-----|------|------|------|------|------|------|
| CAGE score | | | | | | | | | 1.0 | .33 | .12 | .06 | .11 | -.02 | .02 | .01 | .04 | .14 | .08 | .11 | .05 | .14 | .08 |
| Drinking and driving | | | | | | | | | | 1.0 | .27 | .01 | .18 | -.03 | .01 | .07 | .04 | .10 | .03 | .08 | .10 | .14 | .17 |
| Moving violations | | | | | | | | | | .27 | 1.0 | .02 | .15 | -.08 | .04 | .09 | .03 | .10 | .03 | .05 | -.03 | .14 | .15 |
| Hours of sleep/day | | | | | | | | | | | | 1.0 | .00 | -.12 | -.03 | -.01 | .03 | .01 | -.01 | .02 | .02 | .05 | -.02 |
| Seat belt use | | | | | | | | | | | | | 1.0 | .05 | .10 | .09 | .14 | .03 | .02 | .03 | .00 | .19 | .09 |
| Hours of TV/day | | | | | | | | | | | | | | 1.0 | .19 | .16 | .06 | -.03 | .00 | -.02 | .03 | .02 | .03 |
| Caffeinated beverages/day | | | | | | | | | | | | | | | 1.0 | .28 | .18 | .00 | .00 | .01 | -.01 | .09 | .01 |
| Fast food eaten/week | | | | | | | | | | | | | | | | 1.0 | .12 | -.02 | -.01 | -.01 | -.01 | .08 | .07 |
| Breakfast eaten/week | | | | | | | | | | | | | | | | | 1.0 | .07 | -.03 | -.01 | .00 | .09 | .02 |
| Diet pills to lose weight | | | | | | | | | | | | | | | | | | 1.0 | .31 | .27 | .11 | .05 | .13 |
| Laxatives to lose weight | | | | | | | | | | | | | | | | | | | 1.0 | .29 | .10 | -.01 | .02 |
| Vomiting to lose weight | | | | | | | | | | | | | | | | | | | | 1.0 | .06 | .04 | .05 |
| STD | | | | | | | | | | | | | | | | | | | | | 1.0 | .07 | .06 |
| Age at first intercourse | | | | | | | | | | | | | | | | | | | | | | 1.0 | .07 |
| Condom use | | | | | | | | | | | | | | | | | | | | | | | 1.0 |

APPENDIX D

DISTRIBUTION OF THE FIVE INDIVIDUAL HEALTH RISK BEHAVIOR INDICES (FIGURES 1D-5D) AND THE COMBINED RISK-TAKING INDEX (FIGURE 6D) BY GENDER

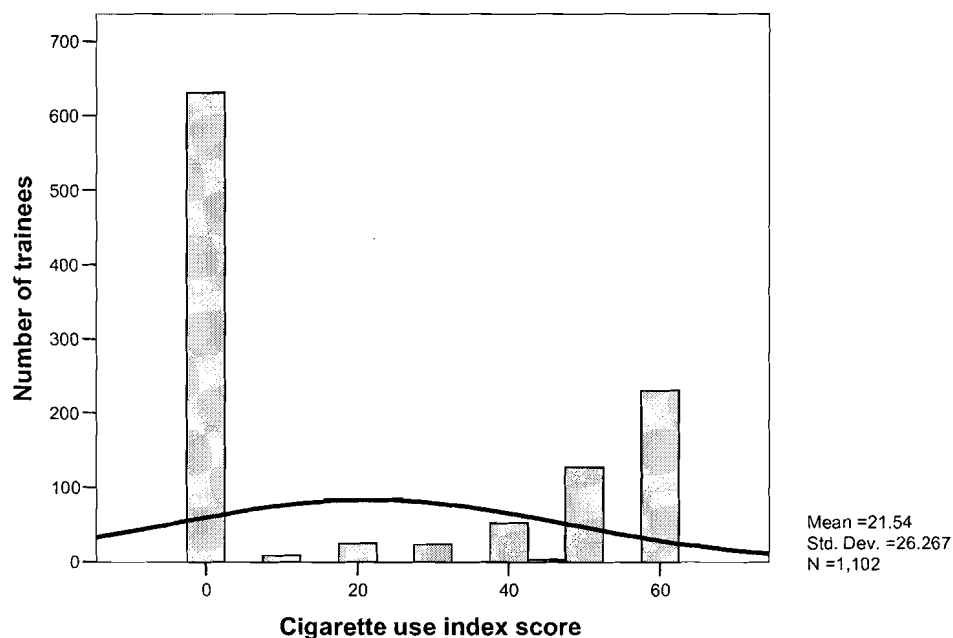


Figure 1Da. Distribution of Cigarette Use Index Score among Male Trainees in Sample

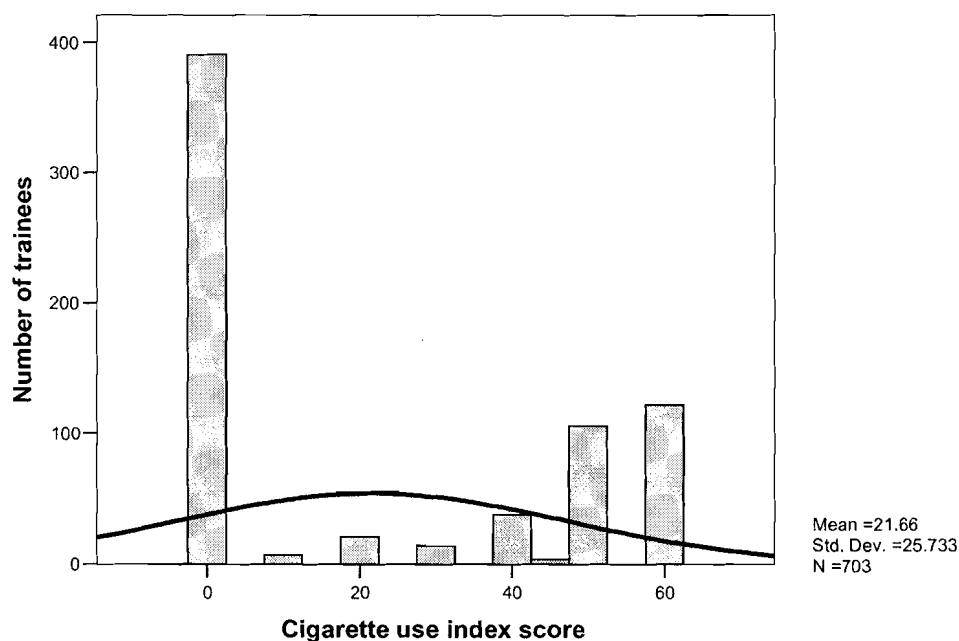


Figure 1Db. Distribution of Cigarette Use Index Score among Female Trainees in Sample

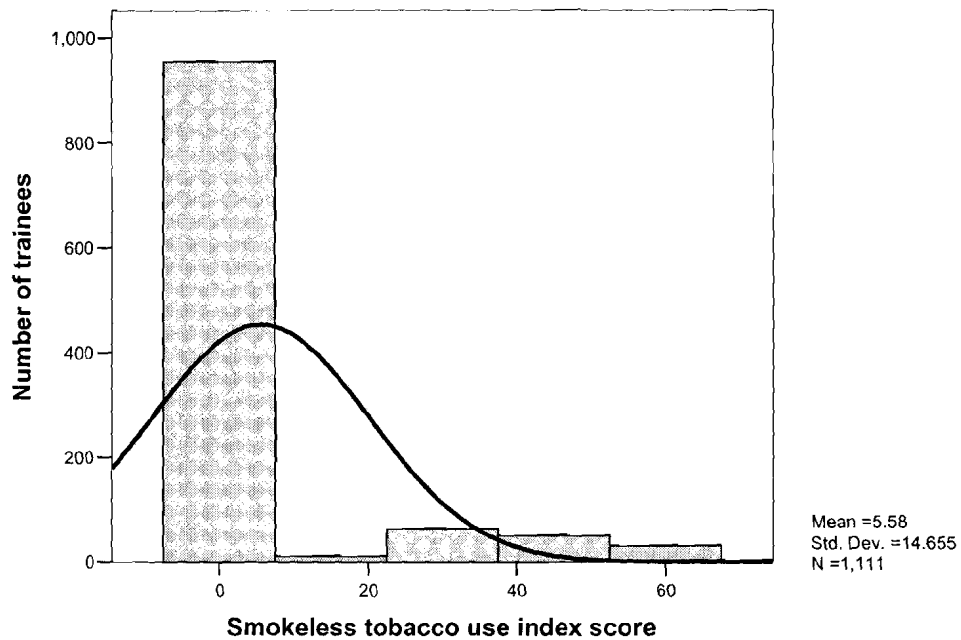


Figure 2Da. Distribution of Smokeless Tobacco Use Index Score among Male Trainees in Sample

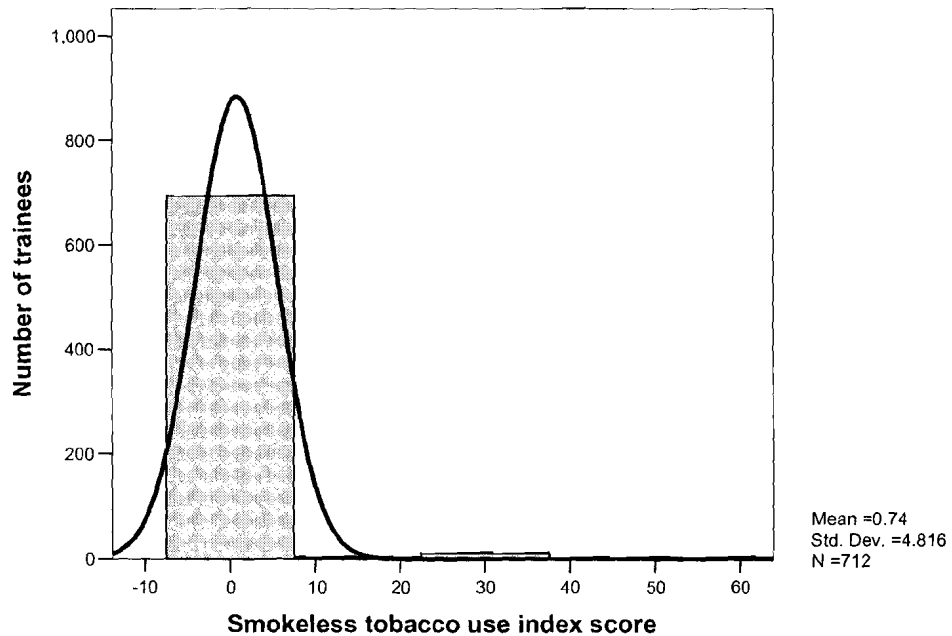


Figure 2Db. Distribution of Smokeless Tobacco Use Index Score among Female Trainees in Sample

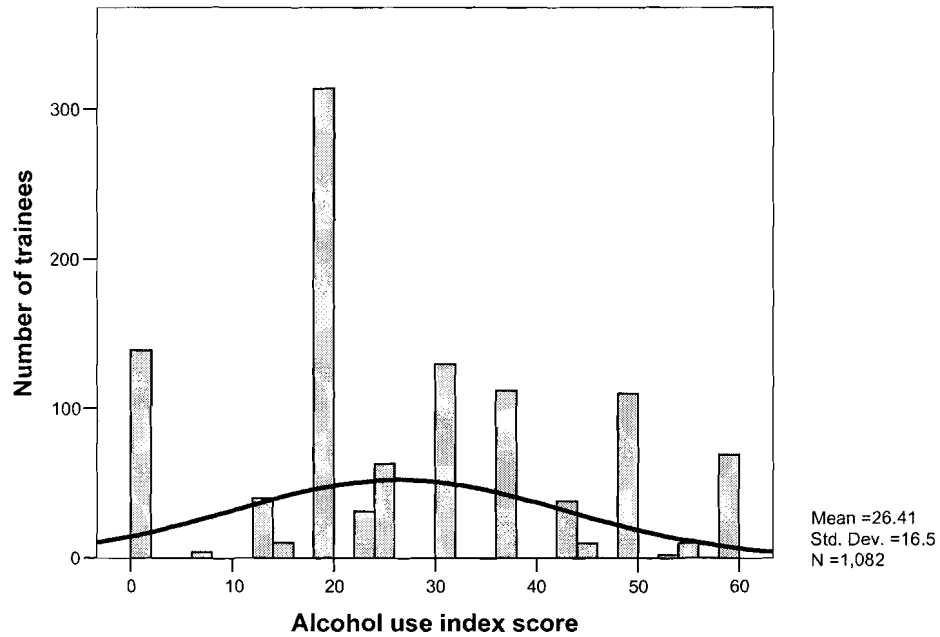


Figure 3Da. Distribution of Alcohol Use Index Score among Male Trainees in Sample

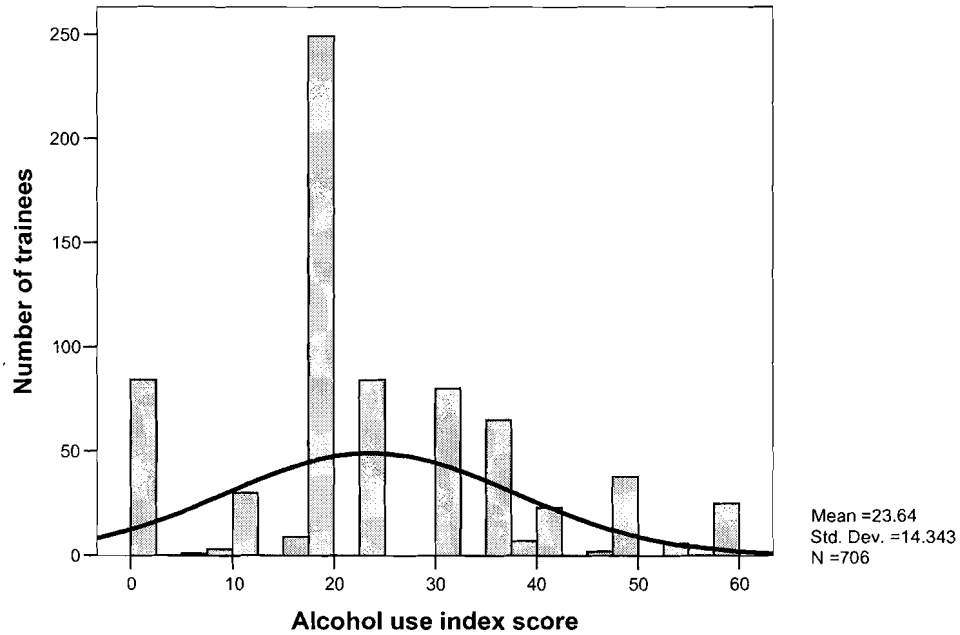


Figure 3Db. Distribution of Alcohol Use Index Score among Female Trainees in Sample

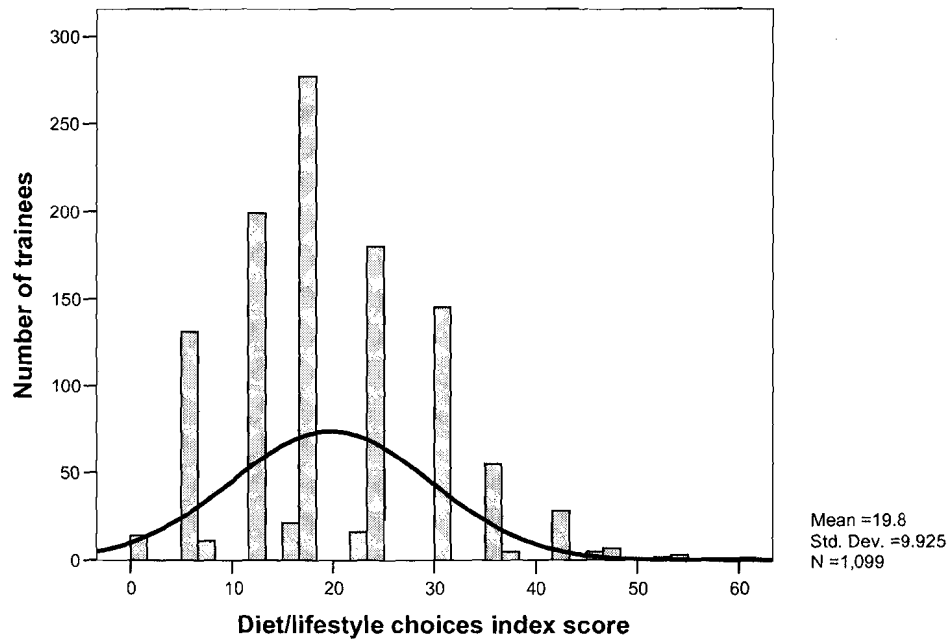


Figure 4Da. Distribution of Diet/Lifestyle Choices Index Score among Male Trainees in Sample

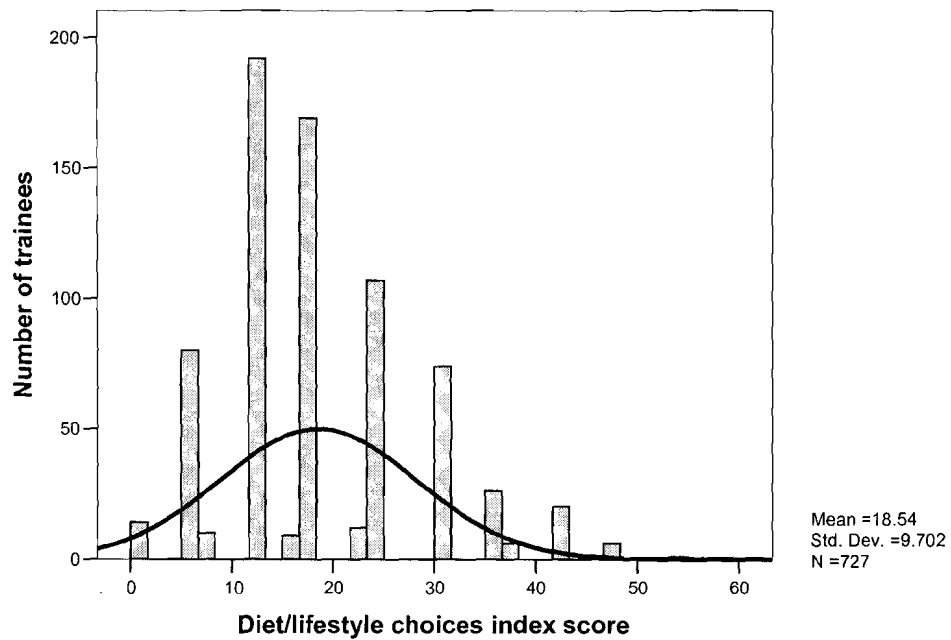


Figure 4Db. Distribution of Diet/Lifestyle Choices Index Score among Female Trainees in Sample

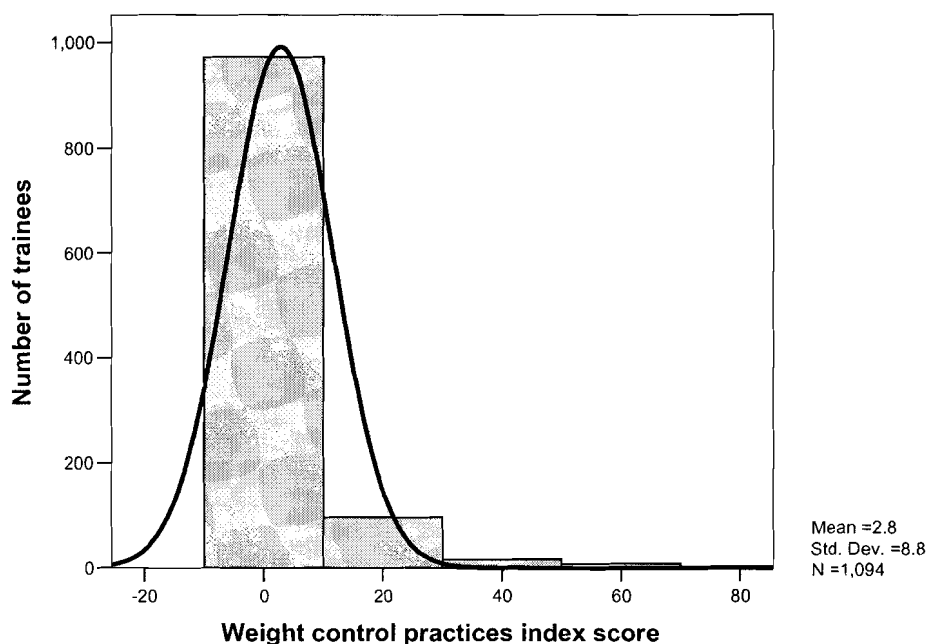


Figure 5Da. Distribution of Weight Control Practices Index Score among Male Trainees in Sample

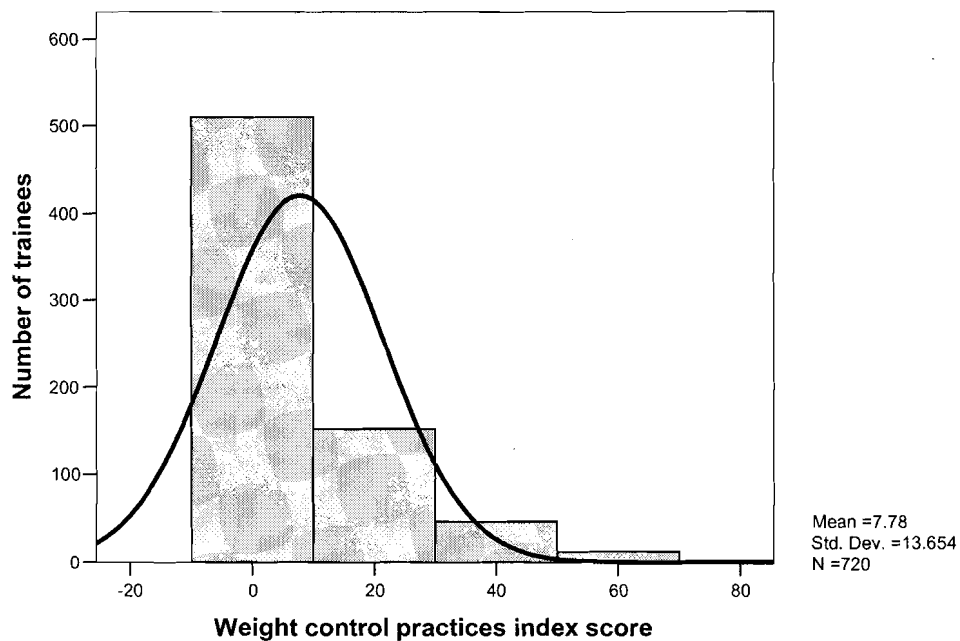


Figure 5Db. Distribution of Weight Control Practices Index Score among Female Trainees in Sample

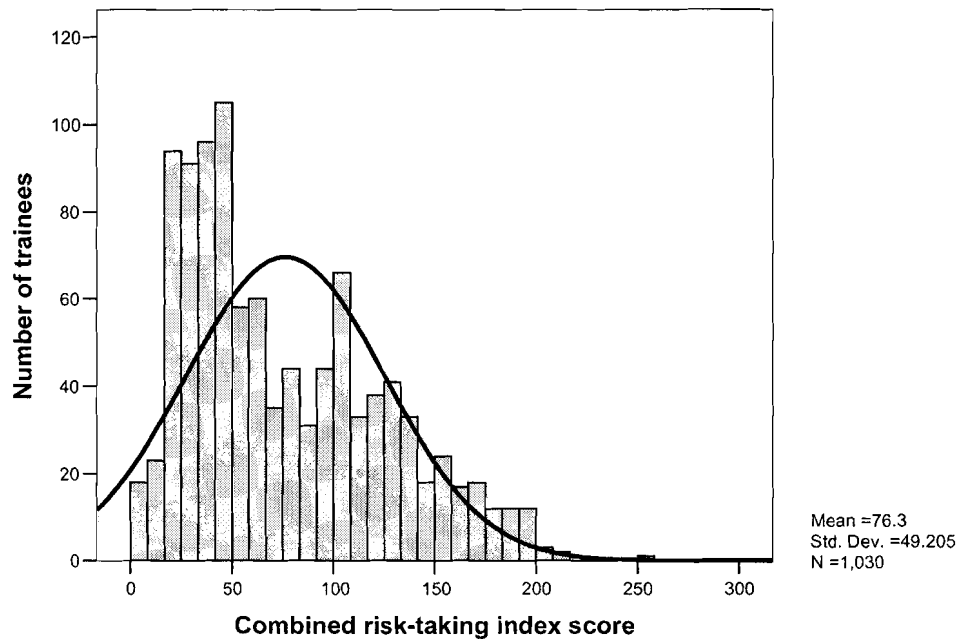


Figure 6Da. Distribution of Combined Risk-Taking Index Score among Males Trainees in Sample

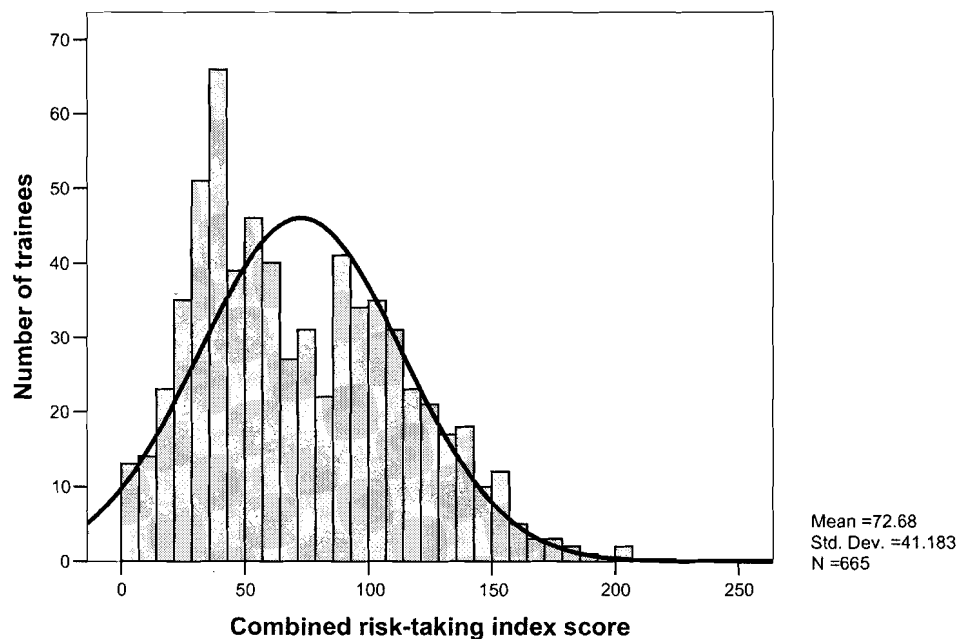


Figure 6Db. Distribution of Combined Risk-Taking Index Score among Female Trainees in Sample

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